Stoddart's Encyclopaedia Americana

American supplement, Encyclopaedia britannica

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STODDART'S

ENCYCLOPÆDIA AMERICANA

A DICTIONARY
OF
ARTS, SCIENCES, AND GENERAL LITERATURE

AND COMPANION TO THE
ENCYCLOPÆDIA BRITANNICA
(NINTH EDITION)
AND
TO ALL OTHER ENCYCLOPÆDIAS

ILLUSTRATED

VOLUME I

NEW YORK, PHILADELPHIA, LONDON
J. M. STODDART
1883

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PREFACE.

WITHIN the last decade and a half there have been offered to American purchasers numerous works of reference possessing high merit, and which were therefore widely and generally acceptable. These works, however, suffered in common under one disadvantage: they had been prepared, primarily, to command the attention of European readers, and they were consequently marked by the limitations which this fact imposed. Among these works may be mentioned *Chambers's Encyclopædia*, unsurpassed in certain departments, especially that of Oriental information; the Ninth Edition of the *Encyclopædia Britannica*, begun in 1875, and furnished to the American public in three forms, and which probably has had a greater circulation in this country than any other work of reference; and, thirdly, the new and illustrated editions of the *Conversations-Lexikons* of Meyer and of Brockhaus—the former completed in 1878, and the latter begun in 1882—which have had an extensive sale amongst those who speak German as their vernacular or have acquired it as part of their scholarship.

The ENCYCLOPÆDIA AMERICANA is designed to answer the popular demand for a work of moderate dimensions, which should supplement and accompany the great Encyclopædias of this class, completing them in particulars where they appear deficient, and bringing down to the latest date their statements and descriptions.

It is not to displace these and similar works of high value that the ENCYCLOPÆDIA AMERICANA has been undertaken. Its aim is to complete them for the use of the reader of the present time. It essays to present to him, in a form worthy of comparison with the best of the extended and elaborate works, such additional matter, and especially such American articles, as will make any of them more satisfactory and more serviceable, supplying for him what they, designedly or otherwise, have omitted, and adding what has come into view by the lapse of time since they left the press.

In the development of this plan large space has been given to articles on American geography, natural history, scientific research, and whatever relates to the vast resources, the rapid development, and recent increase in our knowledge of the continent. It has been designed to meet the new awakening of interest in American history, sociology, and archæology, to furnish information on biographical and legal topics, and to present—for the first time in a general encyclopædia—a clear and concise but exhaustive treatment of the history of American political parties. Many other topics distinctively American—the religious denominations and benevolent institutions of the country; its great natural resources; its agriculture, so different in many respects from that of other countries; its industries, evolved from and adapted to the circumstances of a new and rapidly-developing country; its enormous deposits of coal; its remarkable growth of railroads; its progress in invention and adaptation of electricity and other natural forces to various novel purposes; its construction of bridges and aqueducts; its banking, and other features of its finances, etc., etc.—receive particular attention, and are treated with the utmost elaboration consistent with the plan of the work.

It seeks, moreover, to meet the American demand for the latest information about peoples, countries, inventions, and discoveries. It includes in its biographies accounts of living men of eminence, as well as of those who have died since recent works of reference, which exclude biographies of those living, were begun. It gives the latest events in the histories of continents and nations, the latest results in exploration, travel, and archæological research. Some special fields have been opened. Scandinavian biography, generally neglected, has had the oversight of one of the most eminent authorities in the literature of that region. In America, especially, the interest in this department is advancing rapidly, not only through the circulation of the works of writers such as Björnson, Ibsen, and Jonas Lie in translations, but through the great immigration from Scandinavia having brought us some excellent scholars and authors who are not content to have their native country and its notable men and books remain unknown to the country of their adoption.

It is confidently believed that this extensive range of subjects has been so managed as to give the work a high value, both as to its general plan of a companion work and as to its independent use. In some departments, notably those of American States and great cities, most of the articles are not only full and brought down to a near date, but they are prepared with such care, and with access to so many new sources of information, as to render them the best attainable authority on the subjects to which they relate. It is anticipated, therefore, that the reader will find the ENCYCLOPÆDIA AMERICANA supplying his wants as a supplementary and additional work, and commanding his appreciation at the same time as one distinct and independent.

In justification of these views the Editors refer to the list of contributors elsewhere given. Desiring to produce a work that would sustain comparison with those which it is designed to accompany, the effort has been made to secure the treatment of each important topic by a writer whose familiarity with it certified the value of his statements; and the degree of success achieved in this will doubtless justify the claim that the completed work fairly represents the scholarship and literary ability of the country. The several articles, so contributed, cover a broad field of knowledge, and as treated by their several authors they are naturally indicative of the individual minds that produced them; but all have been held to, and no doubt have scrupulously observed, the rule of a sincere and unqualified fidelity to the truth. There are some instances—the most prominent of which are probably the articles referring to the Scriptures—in which it has been thought that adherence to the rule stated made it needful to present different conclusions from those given in certain articles in the *Encyclopædia Britannica*, but this step, taken under the compulsion of the special circumstances, it has very seldom been found necessary to repeat.

The Publisher feels that he is under obligation which should be acknowledged to many contributors who have kindly given him assistance in various particulars, and especially to several who have had an oversight of special departments.

It is expected that the whole work will be included in four volumes of about the same size as the present, and that a second volume will appear before the end of the present year.

PHILADELPHIA, *September, 1883.*

⁂ *The marginal references attached to a portion of the articles in this volume relate to the volume and page of the* ENCYCLOPÆDIA BRITANNICA (*Ninth Edition*), *where a further article on the given subject will be found.*

LIST OF CONTRIBUTORS TO THE ENCYCLOPÆDIA AMERICANA.

VOLUME I.

This list embraces the names of those contributors only whose names are signed (by their initials) to articles in the present volume. The unsigned articles may be ascribed, in most instances, to the more immediate and personal work of the Editor and his Assistants.

Where two or more contributors have the same initials, a distinction has been made in printing them, which will enable the reader to assign to each his own work.

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ENCYCLOPÆDIA AMERICANA.

AAL—AASEN.

AAL, Jacob (1773–1844), a distinguished Norwegian writer, born in Porsgrund, July 27, 1773. He studied in Copenhagen, first theology and afterwards natural science. In 1797 he went to Germany and studied science at the universities of Kiel, Leipsic, and Göttingen, and spent the winter 1798–99 in Freiberg, where he heard Werner. He returned to Norway in the summer of 1799, and purchased the large Nœs iron-works. In 1814 he became one of the framers of the present constitution of Norway, and subsequently served several terms in the Storthing. With his vast means he aided literature and science, and many important works were published at his expense. His own literary works were partly on politics and political economy as magazine articles, of which he collected the most important ones and published them in three volumes entitled *Present and Past* (*Nutid og Fortid*), 1832–36, partly historical, relating both to antiquity and to his own eventful lifetime. His translation of Snorre Sturleson's *Hemskringla* in four folio volumes, published 1838–39, is a standard work. His *Erendringer* (*Reminiscences*), as a contribution to the history of Norway from 1800 to 1815, is one of the most important historical works written on the nineteenth-century history of Norway. It is a work full of facts in regard to the complications between Norway, Sweden, and Denmark: on account of the author's friendly relations with the eminent men of the three countries it is at once thoroughly patriotic and free from ill-will towards Denmark and Sweden. He died Aug. 4, 1844. (R. B. A.)

AARESTRUP, Carl Ludwig Emil (1800–1856), Danish lyric poet, born Dec. 4, 1800, in Copenhagen, spent the greater part of his life as a practising physician in Lolland. His poems are found in two volumes, the first published in 1838, and the second after his death, in 1863. In style he is compared with Heine and Moore. He died in 1856.

AARS, Jakob Jonathan, a Norwegian linguist, born in Christiania, July 12, 1837, in which city he established a gymnasium in 1863. In 1862 he published a grammar of the Old Norse language; in 1864 a translation, with commentaries, of several poems of the elder Edda (*Udvalg norske Oldkvad*), and since that he has written many important articles on language and mythology.

AASEN, Ivar Andreas, a Norwegian botanist, philologist, and poet, was born of peasant parents, Aug. 5, 1813, and received his education at the house of a parish clergyman. He obtained a situation as a private teacher, and devoted his attention to botany. His attention was drawn to philological questions by the practice of devising Latin names for Norwegian plants unknown to the Romans. He tried to substitute native names, but found that these differed with the dialects of the different provinces. This led him to examine the relations of those dialects, and he sent to the Throndhjem Scientific Society a dissertation on the dialect spoken in Sandmöre, his native province. The society undertook to support him in making a collection for a dictionary of the *Folkesprog* ("speech of the people") of Norway, and he spent several years in travel with this view. In 1847 he settled in Christiania and began to write up his collections, and published a grammar in 1848 and a dictionary in 1850. He showed the unity in variety of those dialects, and their relation to the old written speech of the Norse and Icelandic sagas, and he reduced the variety of dialectic forms to normal forms. It was P. A. Munch, the philologist, who first saw in these labors the accomplishment of a proposal which he himself had made in 1832 and 1845. He had suggested the formation of a national language by a comparison of the Norse dialects which should take the place long held by the Danish in literary and educational use. Aasen fell in with this idea, and in 1853 published "specimens" of those dialects, with translations into the new normal language, and followed this up with original works, especially poems, in the same tongue. In this he found many followers, the most notable being Aasmund Vinje and Kristofer Janson, poets of much ability and popularity. Several periodicals were published in the new speech. It was resisted by the conservatism of the official classes, and by the more moderate reformers, who desired merely to modify the current Norse-Danish speech of the educated classes. The controversy still continues, and Aasen still labors for the perfection and extension of his national Norse speech. But he has not won the philologists generally to his support; even Munch in 1853 gave up the attempt as hopeless, and none of the greatest names in the very vigorous literature of Norway have declared for it. For a time Björnsterne Björnson was drawn towards it by his strong national feeling, but in 1879 he published a letter giving in his adherence to the moderate reformers. Hendrik Ibsen and Jonas Lie have not been influenced by Aasen.

Aasen's poems are generally idyllic pictures of peasant-life in Norway and translations from English, German, and French. (See "Die Sprachbewegung in Norwegen," by Konrad Maurer, in Bartsch's *Germania*, 1880.) (R. E. T.)

See Vol. I. p. 12 Am. ed. (p. 4 Edin. ed.).

ABANDONMENT, a term in law signifying generally a surrender of property or of a right, but more particularly—

In Marine Insurance. The act by which the insured, in case of a partial loss, surrenders his rights to the insurer and claims under his policy a total loss. In such a case the loss is said to be a *constructive* or *technical* total loss. Strictly speaking, the abandonment by the insured consists of a transfer of his interest in the insured property in its damaged condition, in consideration of the insurer treating the loss as a total one under the contract of insurance. In our American contracts of marine insurance it is generally provided that there shall be no constructive total loss by abandonment except where there is an injury to the thing insured exceeding fifty per cent. upon an estimate "as for a partial loss." As the policy in most cases provides that in estimating a partial loss an allowance of one-third off "new for old" shall be made to provide for the deterioration in value of the parts of the vessel, it follows that the estimated cost of repairs necessary to restore the vessel to good condition must exceed seventy-five per cent. of her value to entitle the insured to the right of claiming by abandonment for a total loss. The valuation on which this estimate is to be made is generally that named in the policy, and in cases of open policies the actual value of the vessel at the time the loss occurs, shown by proper evidence. The Federal courts have inclined to the view that the latter basis of valuation should prevail in all cases, whether the policy be valued or open, and the courts of some of the States have held to the same rule. In several of the States, however, the valuation in the policy determines the valuation on which the estimate is to be made. No special form is necessary either for making abandonment or for accepting it, but it should be made as soon as the insured is in possession of information of facts justifying it, or else he will be considered as having elected not to exercise his right to abandon. It is optional with him, but when once made and accepted is irrevocable. After abandonment by the insured and acceptance by the insurer, the insurer becomes the owner, and entitled to the possession of all that is left of the insured property, and the owner and master of the vessel are bound to act in good faith in regard to the insured property in such manner as will protect the interests of the insured, for, so far as the insured property is concerned, they become virtually the trustees of the insured. (S. W.)

See Vol. I. p. 12 Am. ed. (p. 5 Edin. ed.).

ABATEMENT (from the French *abattre*, Law French *abater*, signifying to "throw down"). The term is used in legal phraseology to indicate a suspension or a reduction or a complete determination. In chancery practice abatement of a suit is the suspension of all proceedings from want of proper parties capable of proceeding or from some other cause, while the abatement of an action at law is a complete determination of the suit by interposing as a plea some matter of fact impeaching the declaration. The effect is to defeat the action without reaching any decision on the merits of the controversy, making it necessary for the plaintiff to begin a new action. The tendency in the present day is to simplify as much as possible legal proceedings, and to prevent the effect of pleas in abatement by allowing amendments in the pleadings, so that the real question in controversy may be tried without the necessity of another suit. The abatement of a *nuisance* is the removal or destruction of it. As applied to a *legacy* or a *contract*, it indicates, in the one case, a reduction of the amount of the legacy by reason of the insufficiency of the assets of the testator's estate to pay all his debts and the legacies as well, and in the other case a reduction made by a creditor in the amount of his claim in consideration of its prompt payment by his debtor. In mercantile law the term "abatement" is also used to indicate the deduction or allowance of import duties made under the acts of Congress by the collector of customs, on account of injury to goods.

Abatement of freehold is the unlawful entry and possession of an estate by a stranger after the death of the last owner and before possession is taken by the heir or devisee. The use of the term had its origin in the ancient law of Normandy, where it was applied to the taking possession of an estate, after the death of the owner and before the heir entered, by one who had an apparent right of possession. It is distinguished from *disseisin*, which is the expulsion by force or fraud of the person seized of the freehold; and from *intrusion*, which is limited to the entry by a stranger on the death of the tenant for life, in violation of the rights of the reversioner or remainder-man. (S. W.)

ABBE, CLEVELAND, an American astronomer and meteorologist, was born in New York, Dec. 3, 1838. He was the eldest son of George Waldo Abbe, and graduated in New York City Free College in 1857. He studied astronomy under Brünow, Gould, Struve, and others, and in 1868 was elected director of the Cincinnati Observatory. Here he inaugurated a system of daily meteorological reports by telegraph, with predictions of the weather for one or two days in advance. This was intended for the benefit of the Chamber of Commerce of that city, and its immediate utility soon caused it to be brought to the attention of the national Government. Similar work was now undertaken for the benefit of the whole country, and officially entrusted to the chief signal-officer of the army, Gen. Albert J. Myer. Prof. Abbe was called to Washington to prepare the weather predictions, and entered on this work Jan. 1, 1871. His diligence in the prosecution of the work has largely contributed to the confidence reposed by the people in that service. He inaugurated the tri-daily predictions and their verifications, the storm-signals, the revision of altitudes, the monthly review, the simultaneous international observations, and the corresponding daily bulletin, with maps of the whole northern hemisphere. The anonymous daily publication in 1871 of the weather probabilities, which were widely circulated by the press associations, led to a general inquiry as to their author, and the name "Old Probabilities" has been frequently applied to Prof. Abbe as the real author of these predictions. While in charge of the Cincinnati Observatory he directed attention to the importance and practicability of securing a greater accuracy and uniformity in the standard of time throughout America, and this matter has since attracted general attention. He is a member of the National Academy of Sciences and of many astronomical, meteorological, and other scientific associations at home and abroad. He has contributed frequently on mathematical, astronomical, and physical, as well as meteorological subjects, to the *Monthly Notes of the Royal Astronomical Society*, *Astronomische Nachrichten*, *The American Journal of Science*, to Prof. Baird's *Record of Science and Industry* (1871–78), and to cyclopaedias.

ABBEY, EDWIN A., an American artist, was born at Philadelphia in 1852. He studied for a time at the Pennsylvania Academy of the Fine Arts under Mr. Christian Scheussele, but he is in the main self-taught, having at an early age engaged actively in making drawings for the publishers. The majority of his book and magazine illustrations have been executed for Harper & Brothers, although he has been employed by other publishers, and has contributed to nearly all the illustrated magazines and newspapers. In 1878, Abbey went to Europe, where he remained for several years, spending his time chiefly in England. The results of his residence in England are many admirable drawings illustrative of English character, scenery, and antiquities, including a series of designs suggested by Herrick's poems. These appeared from time to time during several years in *Harper's Magazine*, and were afterwards made into a sumptuous volume (1882). Like all of Abbey's best works, these drawings are characterized by grace, refined humor, and poetical feeling, and the series very adequately represent the range and characteristics of the artist's talent. Another series, illustrative of Keats's *Eve of St. Agnes*, contains several meritorious drawings, but the artist found the elaborate word-painting of Keats less inspiring to him than the quaint suggestiveness of Herrick, and the series as a whole fails to do its original justice. In addition to his drawings in black and white, Abbey has made a number of paintings, chiefly in water-color, and he has been a frequent contributor to the exhibitions in New York and London. Among his paintings which have been cordially praised for their superior qualities are The Stage-Office, The Evil Eye, Lady in a Garden, and A Rose in October. Abbey is a member of the New York Society of Water-Color Painters, of the New York Etching Club, and of the Tile Club. (W. J. C., JR.)

ABBOT, EZRA, S.T.D., LL.D., an American biblical scholar, was born in Jackson, Me., April 28, 1819. He graduated at Bowdoin College in 1840, with high reputation as a classical scholar. After spending some years in teaching he took up his residence in Cambridge, Mass., in 1847. In 1856 he was appointed assistant librarian of Harvard College, with the exclusive charge of the cataloguing department. In 1872 he became professor of New-Testament criticism and interpretation in the Divinity School of Harvard University, which position he still holds (1883). He was elected a member of the American Oriental Society in 1852, and of the American Academy of Arts and Sciences in 1861; received the degree of LL.D. from Yale College in 1869, the same from Bowdoin in 1878, and the degree of S. T. D. from Harvard College in 1872, though a layman. He published in 1864 *Literature of the Doctrine of a Future Life*, containing the titles of more than 5300 distinct works on the subject, as an appendix to W. R. Alger's *Critical History* of the doctrine, and it was issued also separately in 1871. He edited, with notes, Norton's posthumous *Translation of the Gospels, with Notes* (1855), Norton's *Statement of Reasons for not Believing the Doctrines of Trinitarians* (1856), and Orme's *Memoir of the Controversy on the Three Heavenly Witnesses* (1866); he also revised and completed Hudson's *Critical Greek and English Concordance of the New Testament* (1870; 7th ed. 1882). He co-operated with Dr. H. B. Hackett in the American edition of Smith's *Dictionary of the Bible* (1867–70, 4 vols. 8vo), giving special attention to the bibliography of the subjects. In 1880 he published *The Authorship of the Fourth Gospel—External Evidences*. Dr. Abbot, after a careful consideration of all the objections which have been presented against ascribing that Gospel to St. John, decides the question in his favor. The work is distinguished not less for the fairness and solidity of the argument than for the comprehensiveness of the learning there displayed. Dr. Abbot assisted Dr. C. R. Gregory of Leipsic in the preparation of the elaborate *Prolegomena* (1883) to Tischendorf's last critical edition of the Greek Testament (1869–72). He was a member of the New-Testament Company of the American Bible Revision Committee, which co-operated from 1872 to 1880 with the English Committee, whose Revised Version appeared in 1881. He has contributed to the *Christian Examiner*, the *Unitarian Review*, the *Bibliotheca Sacra*, the *North American Review*, the *Journal of the American Oriental Society*, and the *Journal of the Society of Biblical Literature and Exegesis*.

ABBOT, FRANCIS ELLINGWOOD, an American philosopher, was born in Boston, Mass., Nov. 6, 1836. He is a son of Joseph Hale Abbot (1802–1873), an eminent educator. After graduating at Harvard College in 1859, he studied theology, and was for some years a Unitarian clergyman. The tendency of his mind was to metaphysical study, and he published in the *North American Review* a series of articles on "The Philosophy of Space and Time," "The Conditioned and the Unconditioned," etc. His views of religion having become more negative than those of the Unitarian body, he left the ministry, and in 1870 established *The Index*, a journal of free thought, published at Toledo, Ohio. The paper was afterwards removed to Boston, and in 1880, Mr. Abbot withdrew from connection with it. He removed to New York, where he has been engaged in giving private instruction.

ABBOTT, EDWIN ABBOTT, D. D., an English educator and author, was born in London in 1838. After a preliminary education in the City of London School, he entered St. John's College, Cambridge, and graduated in 1861 with high classical honors. He won several prizes, and was made a fellow of his college. He was ordained deacon in 1862, and priest in the year following. After a few years' experience in teaching at Birmingham and at Clifton College, he was appointed in 1865 head-master of the City of London School. This school was established in 1834 by the corporation of London, and has a large endowment. It is intended to furnish a liberal and practical education on moderate terms, and has an attendance of more than 600 pupils. Mr. Abbott organized a thorough system of instruction in the English language, and for this purpose prepared a number of elementary text-tooks in grammar and composition. His *Shakespearian Grammar* has met with great favor, and is recognized as the standard work on the language of Shakespeare. *English Lessons for English People*, prepared by him in conjunction with Prof. J. R. Seeley, is widely used as a text-book in America as well as in England. In connection with the Education Bill of 1870, which reconstructed the whole system of public education in England, Mr. Abbott organized a deputation of head-masters, who urged upon the Government the necessity of forbidding the teaching of any religious catechism in the board schools. The object of this was to prevent fierce sectarian controversies at the election of local school boards. The clause inserted for this purpose was adopted. Through Mr. Abbott's exertions provision was afterwards made for the scholarship which secures to the successful candidate from the schools under the London board free admission to the City of London School. The first pupil to gain this scholarship afterwards won a scholarship at Trinity College, Cambridge, and was senior classic in 1881. In recognition of Mr. Abbott's services to the cause of education the archbishop of Canterbury conferred on him in 1872 the degree of D. D. He has also been chosen select preacher in the universities of Cambridge and Oxford, and the sermons preached in these courses have been published in two volumes, called respectively *Cambridge Sermons* (1875) and *Oxford Sermons* (1878). His Hulsean lectures have been published under the title *Through Nature to Christ* (1877). He has also prepared an annotated edition of *Bacon's Essays* (1876) and a sketch of *Bacon and Essex* (1877). To the ninth edition of the *Encyclopædia Britannica* he has contributed the elaborate article on the "Gospels." The same views of the compilation of these lives of Christ are presented in his *Onesimus* (1882), a well-written story of the age of the apostles, and a continuation of his *Philochristus* (1878), in which he professes to give the Gospel story as witnessed by a disciple.

ABBOTT, JACOB (1803–1879), an American author of numerous religious, biographical, educational, and juvenile works, was born at Hallowell, Me., Nov. 14, 1803. He graduated at Bowdoin College in 1820, and studied theology at Andover. In 1824 he became tutor and afterwards professor of mathematics in Amherst College, and in 1826 was licensed to preach. By invitation of some friends in 1829 he opened in Boston the Mount Vernon school for young ladies, which proved highly successful. He had already commenced his career of authorship in 1828, and some lectures on religion given in connection with his school were published in 1832 under the title of *The Young Christian*, which at once obtained a wide popularity, and led to the preparation of three more volumes, forming a series of the same character. As these books came out they were republished in England, and one of them, *The Corner-stone*, was severely criticised by Rev. (afterwards

Cardinal) John Henry Newman in the celebrated *Tracts for the Times*. He charged the author with introducing rationalistic principles into religion and approaching Socinianism. But the popularity of the series was unabated, and while thousands of copies were sold in the United States, numerous editions were issued in England. Mr. Abbott was ordained Sept. 18, 1834, as an evangelist, and ministered to the Eliot Church, which he had organized in Roxbury, Mass., but about a year later gave up his charge to his brother, John S. C., and devoted himself chiefly to authorship, especially of works for the young. In 1834 he had commenced "The Rollo Books," and when he removed to Farmington, Me., in 1839, he continued writing these and others of a similar character until 1843, when he made his first visit to Europe. On his return he joined with his brothers Gorham and Charles in establishing a school for young ladies in New York. In 1845 a school for boys was added, of which he was principal for five years, but in 1851 he relinquished teaching for authorship. He still resided in New York, but made several voyages to Europe and frequent visits to Farmington. In 1870 he made the latter place his residence, and died there, Oct. 31, 1879. He was the sole author of 180 volumes, and editor or joint author of 31. Most of these were issued in series, as the "Rollo Books" (28 vols.), "The Lucy Books" (6 vols.), "Harper's Story-Books" (36 vols.). He also prepared biographies of many prominent persons of ancient and modern times. His last series was *Science for the Young* (4 vols., N. Y., 1871–73). His success was due to constant familiarity with children and to his good judgment, which limited him to the work for which he was fitted by nature and experience. His style is clear and simple; he wrote not for literary effect, but with a moral purpose, and his manner and spirit have had great effect on other writers for the young. Many of his books have been republished in Europe, and his religious writings have been translated into several European and Asiatic languages.

ABBOTT, JOHN STEVENS CABOT (1805–1877), an American historian and religious writer, was born in Brunswick, Me., Sept. 18, 1805. He graduated at Bowdoin College in 1825, studied theology at Andover, and became pastor of a Congregational church in Worcester, Mass. His first book, *The Mother at Home*, was published in 1833, and was soon followed by *The Child at Home*. These were favorably received, and have since been translated into several of the European languages, as well as by missionaries in Asia and Africa. In 1836 he succeeded his brother Jacob in charge of the church in Roxbury, and afterwards removed to Nantucket. In 1844 he retired from pastoral labors to devote himself to literature, though at intervals he took charge of congregations for a short time. After writing *Kings and Queens* and some brief biographical works, he was led to attempt the more ambitious subject with which his name is chiefly connected, *The History of Napoleon Bonaparte*, first issued as a serial in *Harper's Monthly Magazine* from 1851 to 1855. In it he showed himself what had never before been found in the English language, an extravagant eulogist of the great emperor. Though his extreme partisanship has been universally condemned, in his subsequent works, *Napoleon at St. Helena*, *Correspondence of Napoleon and Josephine*, he maintained the same views, and in his *History of Napoleon III.* extended his advocacy to the latter. He wrote also *The French Revolution of 1789*, *A History of the Civil War in America* (1863–1866), *Lives of the Presidents* (1867), *Histories of Austria, Russia, Spain*, and *Italy*, and *The History of Frederick the Second, called Frederick the Great* (1871). The interest of his subjects and the animation of his style have secured him numerous readers, but he is deficient in the judicial traits which should characterize an historian. Among his later writings was a volume addressed to young men on *Practical Christianity*. He died at Fair Haven, Conn., June 17, 1877.

ABBOTT, LYMAN, D. D., was born Dec. 18, 1835, in Roxbury, Mass., the third son of Rev. Jacob Abbott. He received a thorough collegiate education at New York University, graduating in 1853. Subsequently, down to 1860, he studied and practised law with his elder brothers, Benjamin, Vaughan, and Austin, under the firm-name of Abbott Brothers. They published several legal works: *Admiralty Reports*, 1 vol.; *New York Practice Reports*; *Forms of Pleading under the New York Code*; an edition of *Sedgwick on Damages*, with notes; contributed a series of articles to various law and commercial magazines; and together, under the *nom-de-plume* "Benauly," published the novel *Cone-cut Corners*, advocating the prohibitory temperance laws. Lyman later withdrew from the firm, and after studying theology with his uncle, the Rev. John S. C. Abbott, accepted a ministerial charge over the Congregational Church of Terre Haute, Ind., in 1860. He remained here five years, and in 1865 became associated with the American Freedmen's Union Commission as its general secretary, in which service he continued for three years. In 1866 he received and accepted a call to the New England Congregational Church in New York City, and remained there for three years, resigning in 1869. In 1871 he became editor of the *Illustrated Christian Weekly*, of which he was the first editor and organizer, published by the American Tract Society. He retained this position for six years, resigning it in the autumn of 1876 to assume, with Henry Ward Beecher, the joint-editorship of the *Christian Union* of New York City. The paper was published under the double management until the autumn of 1881, when Mr. Beecher withdrew and Mr. Abbott became editor-in-chief. Since 1869, Mr. Abbott has resided at Cornwall-on-the-Hudson, engaged in literary and editorial duties. He has published numerous works, of which the most important are—*Jesus of Nazareth, His Life and Teachings*, 1869; *Old-Testament Shadows of New-Testament Truths*, 1870; *Morning and Evening Exercises, selected from the Writings of Henry Ward Beecher*, 1871; *Laicus; or, The Experiences of a Layman in a Country Parish*, 1872; *A Popular Religious Dictionary*, 1873; *Revision of New-Testament Notes*, by Jacob and John S. C. Abbott, 1881; and is now (1882) engaged in writing a *Commentary on the New Testament*, the four volumes of which already published carry the student up to and through the Acts of the Apostles. He received some years since the honorary title of D.D. from the New York University.

ABBREVIATIONS. American usage has modified many of the abbreviations in use in Europe, and has established several classes in distinctive forms little applicable to use elsewhere or known in other countries, yet indispensable to the general student. They may be classified as—*first*, those applicable to the government, the army, and the navy; *second*, those in use in legal proceedings and the statutes; *third*, those applied to the States, or geographical; *fourth*, scientific and medical; *fifth*, those relating to weights, measures, money, and business; *sixth*, those used by secret and other societies; and *seventh*, those of various religious bodies, etc. The increasing use of abbreviations in ordinary writing might justify the enlargement of these classes or the addition of others; but the rule here adopted is to accept nothing lacking in the requirements of both necessity and fixedness as a distinctive and significant abbreviation, meaning what it stands for, and not to be mistaken for anything else.

See Vol. I. p. 31 Am. ed. (p. 26 Edin. ed.).

First—The Government, Army, and Navy.

A. A. G., Assistant Adjutant-General.
A.G., or Adjt.-Gen., Adjutant-General.
Agl. Dept., Department of Agriculture.
A. Q. M., Assistant Quartermaster.
A. Q. M. G., Assistant Quartermaster-General.
Asst. Sec., Assistant Secretary.
Asst. Supt., Assistant Superintendent.
Asst. Treas., Assistant Treasurer.

Atty., Attorney.
Atty.-Gen., Attorney-General.
Brig.-Gen., Brigadier-General.
Capt., Captain.
Ch. Clk., Chief Clerk.
Col., Colonel.
Com., Commodore.
Com., Committee.
Comr., Commissioner.
Com. & Nav., Commerce and Navigation.
Cong., Congress.
Dept., Department.
Dist., District.
Div., Division.
Doc., Document.
Eng. Dept., Department of Engineers.
Ex. Doc., Executive Document.
Gen., General.
Gov., Governor.
Govt., Government.
Hon., Honorable.
H. R., House of Representatives.
Int. Dept., Department of the Interior.
Int. Rev., Internal Revenue.
Lt., or Lieut., Lieutenant.
Maj., Major.
Maj.-Gen., Major-General.
M. C., Member of Congress.
Mess. & Docs., Message and Documents.
Pat. Of., Patent Office.
P. M., Postmaster.
P. M.-Gen., Postmaster-General.
P. O., Post-Office.
Pres., President.
Pub. Doc., Public Document.
Q. M., Quartermaster.
Q. M.-Gen., Quartermaster-General.
Sec., Secretary.
Sen. Doc., Senate Document.
Sergt., Sergeant.
Surg.-Gen., Surgeon-General.
U. S., United States.
U. S. A., United States of America, United States Army.
U. S. N., United States Navy.
U. S. S., United States Senate.
U. S. S., United States Steamship (of war).
V.-P., Vice-President.

Second—Statutory and Legal.

Abb., Abbott's U. S. Circuit and District Court Reports.
ad lib., *ad libitum*, at pleasure.
Admr., Administrator.
Admx., Administratrix.
Ald. Alderman.
Ans., Answer.
Art., Article, a distinct provision or stipulation.
Biss., Bissel's Circuit Court Reports.
Blatch., Blatchford's Circuit Court Reports.
C., ch., chap., chapter.
Circ., Circuit.
C. J., Chief-Justice.
Clk., Clerk.
C. P., Common Pleas.
Crim. Con., Criminal Connection.
Curt., Curtis's Supreme Court Reports.
Cush., Cushing's Massachusetts Reports.
Cr., Credit, Creditor.
Ct., Court.
Dall., Dallas's Pennsylvania Reports.
Def., Dft., Defendant.
Dill., Dillon's Reports.
et al., *et alii*, and others.
et seq., *et sequens*, and following.
Exr., Executor.
Exx., Executrix.
fi. fa., *fieri facias*.
hab. corp., *habeas corpus*, have the body.
How., Howard's U. S. Supreme Court Reports.
ib., or ibid., *ibidem*, in the same place.
J., Justice or Judge.
J. P., Justice of the Peace.
Jud., Judicial.
L. S., *locus sigilli*, place of seal (on documents).
Pet., Peters's Reports U. S. Circuit Court.
Plf. or Plff., Plaintiff.
pro tem., *pro tempore*, for the time.
Repts., Reports.
Res., Resolution.
Rev., Revenue.
Rev. Stat., Revised Statutes.
s., sec., section.
sci. fa., *scire facias*.
Sess., session.
ss., sessions.
Stat., Statute.
Sum., Sumner's Reports U. S. Circuit Court.
Sup., Supreme.
Sup. Ct., Superior Court.
v. and vs., *versus*, against.
Wall., Wallace's Supreme Court Reports.
Wheat., Wheaton's Supreme Court Reports.
Wood., Woodbury & Minot's U. S. Circuit Court Reports.

Third—Geographical.

Ala., Alabama.
Alb., Albany.
Ari. or Ariz., Arizona.
Ark., Arkansas.
Balt. or Balto., Baltimore.
Bost., Boston.
Cal., California.
Ches., Chesapeake.
Chic., Chicago.
Cin., Cincinnati.
Co., county.
Colo., Colorado.
Conn. or Ct., Connecticut.
Dak., Dakota.
D. C. or Dist. Col., District of Columbia.
Del., Delaware.
Dist., district.
Div., division.
Fla., Florida.
Ga., Georgia.
Galv., Galveston.
Ia., Iowa.
Id., Idaho.
Ill., Illinois.
Ind., Indiana.
Ind. Ter., Indian Territory.
I., Is. or isl., island.
Kan. or Kans., Kansas.
Ky., Kentucky.
L., Lake.
La., Louisiana.
Lat., latitude.
L. I., Long Island.
Long., longitude.
Mass., Massachusetts.
Md., Maryland.
Me., Maine.
Mex., Mexico.
Mich., Michigan.
Minn., Minnesota.
Miss., Mississippi.
Mo., Missouri.
Mon. or Mont., Montana.
Mts., Mountains.
N. A., North America.
N. B., New Brunswick.
N. C., North Carolina.
N. E., New England.
Neb., Nebraska.
Nev., Nevada.
N. H., New Hampshire.
N. J., New Jersey.
N. M. or N. Mex., New Mexico.
N. O., New Orleans.
N. S., Nova Scotia.
N. Y., New York.
O., Ohio.
Or. or Oreg., Oregon.
Pa., or Penn. or Penna., Pennsylvania.
P. E. I., Prince Edward Island.
Phila. or Phil., Philadelphia.
P. R., Porto Rico.
Prov., province.
R. or Riv., river.
R. I., Rhode Island.
S. A., South America.
S. C., South Carolina.
Tenn., Tennessee.
Tex., Texas.
Tp., township.
U. S., United States.
Va., Virginia.
Vt., Vermont.
Wash., Washington.
W. I., West Indies.
Wisc., Wisconsin.
W. T., Washington Territory.
W. Va., West Virginia.
Wy. Ter., Wyoming Territory.

Fourth—Scientific, Literary, and Medical.

āā, *ana*, of each.
A. B. or B. A., Bachelor of Arts.
Acad., Academy.
Acad. Nat. Sci., Academy of Natural Sciences.
Amer. Acad., American Academy.
Amer. Ass. Adv. Sci., American Association for the Advancement of Science.
A. M. or M. A., Master of Arts.
Amer. Phil. Soc., American Philosophical Society.
Ann., Annales, Annals.
Ass. or Assn., Association.
bar., barometer.
C. or Cels., Celsius' scale for the thermometer.
Cent., Centigrade, a scale of 100 degrees from freezing to boiling.
D. D. S., Doctor of Dental Surgery.
deg., degree.
dr., drams or drachms.
duo, 12mo, duodecimo (twelve folds).
Ed., Editor.
ed., edition.
ex., example.
ex. gr., *exempli gratiâ*, for example.
et seq., *et sequens*, and what follows.
F. or Fahr., Fahrenheit's scale of the thermometer, which makes 32° the freezing- and 212° the boiling-point.
fol., folio.
gen., genus, genera, generic.
gr., grains or grammes.
Gr., Greek.
Heb., Hebrew.
i. e., *id est*, that is.
LL.B. Bachelor of Laws.
LL.D., Doctor of Laws.
M. D., Doctor of Medicine.
Mem., Memoirs.
Misc., Miscellaneous.
MS., MSS., Manuscript, Manuscripts.
n. o. p., not otherwise provided for.
oct. or 8vo, octavo.
ol., *oleum*, oil.
p. and pp., page and pages.
Ph. D., Doctor of Philosophy.
Proc., Proceedings.
4to, quarto.
Q. E. D., *quod erat demonstrandum*.
q. s., *quantum sufficit*.
R., Reaumur thermometric scale.
℞., Recipe, prescription.
Sp. grav., specific gravity.
Tab., table, tabular statement.
Tr. or Trans., Transactions.
v., vs., verse, verses.
vol., volume.
V. S., Veterinary Surgeon.

Fifth—Business, Weights, and Measures.

A., acre.
acct., account.
agt., agent.
avdp., avoirdupois.
advt., advertisement.
bbl., bbls., barrel, barrels.
bdls., bundles.
bds., bonds.
bk., bark—a vessel.
bls., bales.
br., brig.
bus., bushel, bushels.
bx., bxs., box, boxes.
c., cts., cent, cents—money.
cent., *centum*, hundred.
cert., certif., certify, certificate.
Co., company.
C. O. D., Collect (or Cash) on delivery.
Cr., creditor.
cs., cases.
csks., casks.
ctl., ctls., cental, centals—weights of one hundred pounds, used authoritatively in California for grain.
cub., cub. ft., cubic, cubic foot.
cur., currency.
cwt., hundredweight. (In the U. S. custom-houses a hundredweight is 112 pounds; in ordinary business transactions, in the United States, it is 100 pounds.)
d., penny, pence—English currency.
dis., disc., discount.
do., *ditto*, the same.
dols., dollars—English use in place of sign $.
doz., dozen, dozens.
Dr., debtor.
dr., drachms or drams.
E. E., errors excepted.
f. o. b., free on board.
fr., frs., franc, francs—19$\frac{3}{10}$ cents United States currency.

ft., foot or feet.
fur., furlong (nearly obsolete).
gal., gals., gallon, gallons.
gr., grs., grain, grains.
hhd., hogshead; two barrels' capacity.
in., inch.
inst., *instante*, the present month.
kgs., kegs.
kilo., kilogramme, French, equal to 2⅕ pounds.
kil., kilometre, French, 3281 feet, or sixty-two hundredths of a mile.
£, *l.*, pound sterling—English.
lb., lbs., pound, pounds.
lin., lineal, right-line measures; *e. g.*, lin. yd., lin. ft., etc.
M., *mille*, one thousand.
m. or mi., mile.
Messrs., *Messieurs*, Sirs.
mfd., manufactured.
mfs., manufactures.
ms. or mth., month.
No. or no., number.
n. s., not specified.
oz., ounce, ounces.
prox., *proximo*, the coming month.
pk., peck.
per ct., per cent., by the hundred.
pref., preferred.
prs., pairs.
pt., pint.
q., question.
qr., quarter.
qt., quart.
R. R., railroad.
rect. receipt.
s., shilling—English.
sch., schooner.
sq., sq. ft., sq. yd., square, square foot, square yard.
str., steamer, steam vessel.
T., ton.
t. f., till forbid; printer's mark on advertisements.
ult., *ultimo*, the last month.
val., value.
wt., weight.
yd., yard.

Sixth—Societies and their Officers.

A. F. A. M., Ancient Free and Accepted Masons.
A. P. A., American Protestant Association.
A. Y. M., Ancient York Masons.
C. O. S., Charity Organization Society.
C. T. A. U., Catholic Total Abstinence Union.
G. A. R., Grand Army of the Republic.
G. P. M., Grand Passed Master.
I. O. G. T., Independent Order of Good Templars.
I. O. O. F., Independent Order of Odd Fellows.
I. O. R. M., Improved Order of Red Men.
K. of P., Knights of Pythias.
K. T., Knights Templar.
O. U. A. M., Order of United American Mechanics.
P. M., Passed Master.
Sec., Secretary.
S. P. C. A., Society for the Prevention of Cruelty to Animals.
S. P. C. C., Society for the Prevention of Cruelty to Children.
S. T., Sons of Temperance.
T. A. B., Total Abstinence Brotherhood.
Treas., Treasurer.

Seventh—Religious.

A. B.C. F. M., American Board of Commissioners for Foreign Missions.
A. B. M. U., American Baptist Missionary Union.
A. B. H. M. S., American Baptist Home Missionary Society.
Abp., Archbishop.
A. B. P. S., American Baptist Publication Society.
A. B. S., American Bible Society.
A. C. A., American Congregational Association.
A. C. U., American Congregational Union.
A. F. B. S., American and Foreign Bible Society.
A. F. C. U., American and Foreign Christian Union.
A. H. M. S., American Home Missionary Society.
A. M. A., American Missionary Association.
A. P., Associate Presbyterian.
A. R. P., Associate Reformed Presbyterian.
A. S. S. U., American Sunday School Union.
A. T. S., American Tract Society.
A. V., Authorized Version.
B. V. M., the Blessed Virgin Mary.
Bp., Bishop.
Card., Cardinal.
C. M., *Congregatio Missionum*, Lazarist Fathers.
Coad., coadjutor.
C. P., or C. Pass., *Congregatio Passionis*, Passionist Father.
C. P. S., Congregational Publishing Society.
C. SS. R., *Congregatio Sanctissimi Redemptoris*, Redemptorist Fathers.
D. D., Doctor of Divinity.
D. F. M. S., Domestic and Foreign Missionary Society (of the P. E. Church).
Dio., Diocese.
Dis., Discipline.
E. L., Evangelical Lutheran.
F. B., Free Baptist.
F. M., Foreign Mission.
F. W. B., Freewill Baptist.
H. M., Home Mission.
H. Y. M. A., Hebrew Young Men's Association.
Luth., Lutheran.
Meth., Methodist.
M. E., Methodist Episcopal.
Mgr., Monsignor.
Monsig., Monsignore.
M. P., Methodist Protestant.
N. S., New School or New Side.
N. V., New Version.
N. W. E. C., North-western Education Commission.
O. P., *Ordinis Prædicatorum*, Dominican Friar.
O. S., Old School or Old Side.
O. S. B., *Ordinis Sancti Benedicti*, Benedictine Friar.
O. S. F., *Ordinis Sancti Francisci*, Franciscan Friar.
Pres., Presbyterian.
Prot., Protestant.
Prov., Province.
P. E., Protestant Episcopal.
P. B., Primitive Baptist.
R. C., Roman Catholic.
R. E., Reformed Episcopal.
Ref., Reformed.
Rev., Reverend.
Rt. Rev., Right Reverend.
R. P., Reformed Presbyterian.
S. B. C., Southern Baptist Convention.
S. I. M., Society for the Increase of the Ministry (P. E. Church).
S. J., Society of Jesus.
S. P. R. L., Society for the Promotion of Religion and Learning (P. E. Church).
S. S., Sunday School.
SS., Saints.
S. T. B., Bachelor of Sacred Theology.
S. T. D., Doctor of Sacred Theology (*Sacræ Theologiæ Doctor*).
U. B., United Brethren.
U. P., United Presbyterian.
V. G., Vicar-General.
W. B. M., Women's Board of Missions.
W. B. M. I., Women's Board of Missions of the Interior.
W. C. A., Women's Christian Association.
W. C. T. U., Women's Christian Temperance Union.
W. H. M. A., Women's Home Missionary Association.
X., Χριστός, Christ.
Xmas, Christmas.
Y. M. C. A., Young Men's Christian Association.
Y. M. C. U., Young Men's Christian Union.
Y. W. C. A., Young Women's Christian Association.

ABD-UL-AZIZ (1830–1876), the thirty-second sultan of the Turkish empire, was born Feb. 9, 1830. He was the second son of Mahmoud II. (1785–1839), the first sultan who fully recognized the superiority of Western civilization and endeavored to introduce its results among his subjects. The eldest son, Abd-ul-Medjid (1823–1861), had continued the same policy, but, owing to his weak disposition, with less success. Abd-ul-Aziz, on his accession, June 25, 1861, manifested the same inclination as his predecessors. He even went further, and, besides largely reducing the civil list, dismissed the seraglio, announcing his intention to have but one wife. He confirmed the liberal constitution, *Hatti-humayun*, granted by his brother in 1856, attempted various reforms in administration, and promised equality of rights to all his subjects. These measures, however, were in many cases in opposition to Mohammedan law as well as to the prejudices of the people, and were imperfectly executed. His chief advisers in public affairs were Aali Pacha and Fuad Pacha, each of whom was in turn grand vizier. Both were men of superior capacity, and throughout their career acted in harmony. They negotiated treaties of commerce with England, France, and Italy. The internal affairs of the empire were greatly disturbed by the conflicting demands of the various religions, races, and nationalities comprised in it. The Danubian principalities secured a greater degree of independence. The Christians of Montenegro, who had excited insurrections in the neighboring provinces, were defeated in 1862 by Omar Pacha, after a bloody war. A still more formidable rebellion began in Crete in 1866, and was for a time openly supported by the king and people of Greece. At last the great powers, alarmed at the probable consequences, induced Greece to withdraw her support, and Crete was obliged to submit in 1869. To bind Egypt more firmly to his power, the sultan had visited that country in 1863, and four years later he bestowed on Ismail Pacha the title of khedive. In the summer of 1867 the sultan attended the Exhibition at Paris, and visited also England, Germany, and Austria. This journey, like the previous one to Egypt, was conducted at an extravagant cost, but eventually did not produce the results that were expected from it either by his ministers or the people of Western Europe. However, he returned to Constantinople still more deeply imbued with French ideas, established a high school open equally to Christians and Moslems, encouraged scientific work, and directed the supreme court to revise and publish the civil code. The ambitious Ismail had continued his efforts to secure the independence of Egypt, but in 1870 he was persuaded by Aali Pacha to visit Constantinople and renew formally his allegiance to the sultan. This was the last success of Abd-ul-Aziz; from this time his career was a series of disasters. The downfall of the French Empire in 1870 gave Russia an opportunity to demand modifications of the Treaty of Paris of 1856, and in Jan., 1871, the unrestricted use of the Black Sea was restored to her by a conference of the great powers at London. Fuad Pacha had died in Feb., 1869, and Aali Pacha died in Sept., 1871. Deprived of these advisers, the sultan fell more and more under the influence of the Russian ambassador, Gen. Ignatieff. The khedive again visited Constantinople in 1872, and, taking advantage of the sultan's financial embarrassments, purchased a practical independence, and at the same time secured the right of succession for his eldest son. The social and financial condition of the Turkish empire became every day more alarming, but Abd-ul-Aziz, exhausted by his earlier attempts to introduce reform, seemed bent only on amassing a private fortune and securing the succession to the throne for his eldest son, in violation of the very custom to which he owed his own position. He had from the first lavished large sums upon the army, and felt secure of its support in any emergency. But the revenues were diminishing, while the taxes were enormous. At last, in 1875, some villages in Herzegovina resisted the tax-gatherers, and soon the insurrection spread through Bosnia. The sultan was unable to take effective measures for its suppression, and in October Turkey declared her inability to pay more than half the interest on the public debt. Another conference of the great powers was held, and the sultan was induced in Feb., 1876, to accept some measures of reform proposed by them. The Moslems, however, stoutly resisted the attempts to confer equal rights upon the Christians, and in some towns massacres took place. The Softas, or theological students, who were gathered in Constantinople to the number of 20,000, clamored for the abdication of the sultan, and at last the sheik-ul-Islam, or head of the Moslem faith, pronounced him unworthy to be caliph. He was deposed May 30, 1876, and his nephew, Murad V., was proclaimed his successor. A few days later it was announced that Abd-ul-Aziz had committed suicide (June 4). (J. P. L.)

ABD-UL-HAMID II., the thirty-fourth sultan of the Turkish empire, was born Sept. 22, 1842, and is the second son of Abd-ul-Medjid. His brother, Murad V., had reigned only three months when his unfitness to rule, through insanity brought on by dissipation, became manifest. He was therefore deposed by the sheik-ul-Islam, and Abd-ul-Hamid succeeded to the throne Aug. 31, 1876. He had been exposed to the same temptations as his brother, but his more vigorous constitution enabled him to escape the same fate, and in later life he has been temperate. His visit to the Paris Exposition in 1867, in company with his uncle, Sultan Abd-ul-Aziz, had enlarged his views and led him to take some interest in the study of geography. He has adopted French habits and dress, yet he has always been an orthodox Turk, and belongs to the Old Turkish party rather than to the imitators of Western civilization who have borne sway in the Ottoman empire since 1840. At his accession the empire was in a chaotic state; insurrections were raging in Herzegovina and Bulgaria; war had been commenced in Servia, and Russia had almost completed her preparations for joining in it. Turkey's credit had been utterly destroyed, and she had no ally to whom she could look for help. The adherents of the different religions in the empire were engaged in bitter strife, which was ready to break into open violence at any moment. To regain the allegiance of his Christian subjects, Abd-ul-Hamid made the same declaration as his predecessors had done, that all his subjects, whatever their religion, should have equal rights before the law. But this had no effect in winning back those who were already in arms. Russia declared war April 24, 1877, and, in spite of the unexpected bravery shown by the Turks, prosecuted the war with such vigor and success that on March 3, 1878, the sultan agreed to the peace of San Stefano. By this his dominions were greatly reduced; Roumania and Servia were enlarged and made entirely independent; the Bulgarian provinces were erected into an independent princedom. At the Berlin Congress, July 13, 1878, the sultan was obliged to submit to further loss; Austria took possession of Bosnia; the territory of Greece was enlarged by the districts of Epirus and Thessaly; and in accordance with a provision which for a time was kept secret England took possession of Cyprus. The sultan resisted the execution of several of these arrangements as long as he dared, and displayed an energy and ambition which had not been expected. Devoutly believing that he is the head of the true faith, he has listened eagerly to the assurances of the fanatical priests that, in spite of the appearances to the contrary, Islam will yet conquer the world. Anxious to hasten its triumph, he has sent his agents to other Mohammedan countries to unite the people in a great effort for this end. Aware of the corruption which had prevailed at Constantinople in former reigns, and distrusting the civil officers by whom he is surrounded, he has endeavored to administer all affairs himself, and has almost effaced the Sublime Porte, or council of government. Yet, compelled to use new and untried agents, he has often failed in improving the administration. Though acute and active, he is wanting in resoluteness and persistency. His irregular methods have produced contradiction and confusion. The modern Turkish party have not ceased to agitate for a change, and to threaten to restore his brother Murad to the throne, on the ground that he is the rightful heir. To strike terror into his foes the sultan determined to remove the most prominent. Midhat Pacha was arrested on the charge of murdering the former sultan, Abd-ul-Aziz. With scarcely a pretence of a trial he was condemned to death, but at the protest of the British Government this sentence was commuted to banishment to Southern Arabia. The sultan, still haunted by fears of assassination, leads a secluded life.

ABEL DE PUJOL, ALEXANDRE DENIS (1785–1861), a French artist, was born at Valenciennes, Jan. 30, 1785. He was descended from an aristocratic family, his father being the baron de la Gran et de Pujol. He began his studies at Valenciennes, and continued them at the École des Beaux-Arts of Paris, and under David. As a pupil of the Beaux-Arts he in 1811 won the *prix de Rome.* The style of Abel de Pujol was greatly influenced by the precepts and example of David, and his works are marked by a certain stiffness and hardness of manner—a manner which in the early part of the century was dignified by the title of "classic," but which later has been condemned as "academic." Abel de Pujol's most important works are decorations at the Museum of the Louvre and the palace at Fontainebleau, and at the convent of the Sacred Heart. Among his pictures may be mentioned The Death of Britannicus, at the Museum of Dijon; St. Stephen Preaching the Gospel, at the church of Saint Étienne-du-Mont; Joseph Explaining the Visions, at Lille; The Baptism of Clovis, at the cathedral of Rheims; and The Raising of Tabitha, at the church of St. Peter at Douai. He was made a member of the Institute in 1835, and an officer of the Legion of Honor in 1854. He died Sept. 28, 1861.

ABENAKIS, the name usually given to the tribes of Algonkin Indians which formerly occupied the territory of Maine and New Hampshire. Under this title were included tribes extending from the Kennebec to the St. John River. The name is of somewhat loose application, but is generally considered as including the Caribas of the Kennebec, the Tarratines of the Penobscot, the Malacites of the St. John, and other smaller tribes. Possibly there was a league or confederacy of these tribes. At all events, Capt. John Smith, who first described them, says that each tribe was governed by a sachem, and that all the sachems were subordinate to a general chieftain called the *bashaba.* The customs of these tribes are like those of the Algonkins generally, but their language is the harshest of the Algonkin dialects. From their position between the French settlements in Canada and those of the English in New England they became involved in the wars of those bitter foes, and played an active part as allies of the French against the English. They were early approached by the Jesuit missionaries, whose converts were induced to remove to Canada, where they composed the mission of St. Francis. These christianized Indians were employed by the French in raids on the English settlements, which they assailed with the crusading zeal of new converts, and whose inhabitants they massacred with the cruel torture of the savage aborigines. At a later date Jesuit missions were established among the Indians who had remained in their old haunts, and they became generally christianized.

We first hear of them in connection with "King Philip's War." A number of them were treacherously captured by Major Waldron of Dover, N. H., and sold into slavery, on the charge of having engaged in this war. In 1689, angered by the pressure of settlers upon their territory, and perhaps instigated by French emissaries, they broke into open enmity, captured the town of Dover (then Cocheco), and barbarously murdered Major Waldron in reprisal for the injury he had done them thirteen years previously. This war continued for years, during which the English settlers suffered severely. The settlements at Salmon Falls and at Oyster River were raided and their inhabitants massacred, the towns of Wells and York were captured, and Fort Royal, on the site of the present city of Portland, was taken, while the whole border was devastated. In the year 1703, instigated by the French, they made a simultaneous attack on the English frontier settlements, and burned, slaughtered, and destroyed along the whole border. In the quaint words of the chronicler, they spared "neither the milk-white brows of the ancient nor the mournful cries of tender infants." In 1704 they made a winter assault on the town of Deerfield, Mass. This was one of the most terrible of Indian raids. The town was utterly destroyed, many of its inhabitants slaughtered, and 112 prisoners carried by a frightful winter journey through the wilderness to Canada. This war was finally quelled by an English invasion of the Indian country.

War broke out again in 1722, caused by English insults to the Abenakis. The settlers suffered severely, but the Indian country was invaded and the Jesuit mission at Norridgewock assailed. This war ended in the brutal slaughter of Sebastian Rasles, the last of the Catholic missionaries in New England, and the breaking up of the community of Christian Indians which he had formed. Peace was concluded with the tribes in 1726, and was never broken. During the American Revolution they embraced the cause of the colonies and did some service.

Some of the Abenakis still exist in Canada, where there are two villages bearing their name. Their remnants in Maine are called Penobscots and Passamaquoddies. Their language was studied by Sebastian Rasles, whose dictionary is of importance. Their history has been written by Rev. E. Vetromile (N. Y., 1866) and in more detail by Rev. J. A. Mauvault (Sorel, 1866).
(C. M.)

ABERCROMBIE, JAMES (1706–1781), a British general, was born at Glasshaugh, Scotland, in 1706. Having entered the army, he became colonel in 1746 and major-general in 1756. He then came to America as second in command to Lord Loudoun. Little was done by them for the protection of the colonies, but, in spite of the protests of the citizens, the soldiers were billeted in private houses in New York and other cities. In 1758, Loudoun was recalled, and Abercrombie had the chief command. An expedition against Canada was planned, and an army of 15,000 men, of whom 9000 were colonial troops, was gathered. With this, the largest force of European origin that had ever been assembled in America, Abercrombie marched against Ticonderoga, where the French had a fortified camp called Carillon. Gen. Montcalm, who held it with about 3600 men, though aware of the large force marching against him, decided to take the risk of remaining. On July 6, 1758, Abercrombie's advance landed near the fort, and in a skirmish Lord Howe, the ablest officer in the English army, was killed. On July 8, Abercrombie attacked the defences on the isthmus leading to the fort, and, as he persisted in observing the same rules of war which had brought disaster on Gen. Braddock's army three years before, he was completely defeated, losing 2000 men. He then retreated across Lake George, and remained inactive until superseded by Sir Jeffery Amherst in September. He returned to England in 1759, and, afterwards entering Parliament, opposed the rights of the American colonies. While acting as deputy governor of Stirling Castle in Scotland he died, April 28, 1781.

ABERDEEN, the county-seat of Monroe co., Miss., is on the west bank of the Tombigbee River, at the head of winter navigation for Mobile boats, and is connected with the Mississippi and Ohio Railroad by the Aberdeen branch road, 9 miles long. It has a fine iron bridge, a handsome court-house, good public schools, a female college, three hotels, and seven chalybeate artesian wells. It is in a rich farming district, and ships annually about 25,000 bales of cotton. Population, 2339.

ABEYANCE, in law, the condition of an estate of inheritance where there is no person in being in whom it is vested. Where, for example, an estate is devised or conveyed to A for life, with remainder to A's unborn son, the inheritance is said to be in abeyance until the birth of A's son, there being no person actually in being in whom it can be said to be vested. Some writers, instead of using the phrase "abeyance," prefer to say that the inheritance is *in nubibus* or *in gremio legis*.

See Vol. I. p. 50 Am. ed. (p. 48 Edin. ed.).

Mr. Fearne, in his *Essay on the Learning of Contingent Remainders*, has expressed the opinion that the inheritance can never be said to be in abeyance, but that it remains vested in the grantor or testator or his heirs until the birth or ascertainment of the person, who is under the grant or will entitled thereto, enables it to vest in him. In this opinion he is sustained by the weight of modern authority. The title to personal property is also sometimes said to be in abeyance when it is undetermined, the property being meantime in the grasp of the law. Where, for example, a vessel is captured in time of war, and brought into port for condemnation, the title thereto is said to be in abeyance until she is duly declared by the admiralty court to be a prize.
(L. L., JR.)

ABILENE, the county-seat of Dickinson co., Kan., is on the Kansas Pacific Railroad, 96 miles west of Topeka and 446 miles east of Denver, Col. It has good public schools, a high school, an academy, seven churches, two weekly newspapers, a Holly company water-works, gas-works, a fine court-house, an opera-house, and many other handsome buildings. It has grown rapidly and has a large trade. Population, 2360.

ABIOGENESIS (Gr. *a* privative; *βιος*, life; *γένεσις*, generation), the generation of living from not living matter—a modern form of the old doctrine of *generatio æquivoca*, or "spontaneous generation." Since life upon this planet must have had a beginning in time and place, abiogenesis is a necessary postulate of a consistent theory of evolution. It is believed by most modern scientists and by all logically-consistent evolutionists that abiogenesis, once resulting in living protoplasm, has never been re-enacted. Others, however, hold that life is continually coming into material being by abiogenesis in the cases of the lowest Protozoans. Reasonable as the supposition may be upon *a priori* grounds, no shadow of the proof has hitherto been forthcoming. The experiments which have been adduced in support of abiogenesis proceed upon the argument that living matter is killed by a certain degree of heat; that liquids have been subjected to such degree, entry of germs from without being effectually precluded; and that living organisms have subsequently appeared in such liquids. Commenting upon the probable fallacy of

See Vol. I. p. 51 Am. ed. (p. 49 Edin. ed.).

such experiments, Huxley remarks: "No experimental evidence that a liquid may be heated to *n* degrees, and yet subsequently give rise to living organisms, is of the smallest value as proof that abiogenesis has taken place; and for two reasons: firstly, there is no proof that organisms of the kind in question are dead, except their permanent incapacity to grow and reproduce their kind; and secondly, since we know that conditions may largely modify the power of resistance of such organisms to heat, it is far more probable that such conditions existed in the experiment in question than that the organisms were generated afresh out of dead matter." (E. C.)

ABOLITIONISTS. The American Revolution found and left African slavery in the United States a political fact. On whatever basis the system rested, on common custom hardened into colonial law in the lapse of years, or on the king's will as expressed in his governors' vetoes of acts to interfere with the introduction of slaves, the Revolution made no attack upon it. It made some efforts, however, to check the slave-trade. The "Articles of Association" prepared by the Continental Congress of 1774 bound the subscribers not to purchase slaves imported after that time, and not to be concerned in the slave-trade; and Jefferson's first draft of the Declaration of Independence contained a paragraph, afterwards stricken out, accusing the king of "waging cruel war against human nature itself" by introducing African slavery into the colonies, and of prostituting his veto power to suppress every legislative attempt to restrain the slave-trade. An attempt to suppress the trade was made by Congress in opening the ports of the country, April 6, 1776; one of the resolutions read "that no slaves be imported into any of the thirteen colonies." But the Congress lacked the power, as the States lacked the desire, to really suppress either slavery or the slave-trade. When the Federal Convention met in 1787 the representatives of Georgia and South Carolina came prepared to insist on a continuance of the slave-trade as a *conditio sine qua non* to a closer union. Their persistence obtained a compromise, Aug. 25, 1787, which became Section 9 of Article I. of the Constitution. By its terms the slave-trade was not to be forbidden before the year 1808, except that a tax of ten dollars a head might be imposed on such "importations or migrations;" and it seems to have been tacitly agreed that the fugitive-slave clause of Article IV. should also be inserted in the revised Constitution. The slave-trade was thus brought at once under the revenue power of Congress, and within twenty years under its commercial power also. As the appointed time drew near President Jefferson reminded Congress of its duty in the premises, and the act of March 2, 1807, finally abolished the slave-trade on and after Jan. 1 following. The coastwise slave-trade, from State to State, was regulated and allowed to continue. It gave rise to many international difficulties through the action of British authorities in freeing slaves found on American coasters forced into British colonial ports by stress of weather. It was not finally abolished until July 2, 1864, an act for that purpose having been passed as a part of the civil appropriation bill.

At first men of all parties, North and South, agreed in condemning African slavery as expensive, wicked, and a growing weakness to the States which continued to allow it. Indeed, the language of Southerners—Washington, Jefferson, Mason, and others—was far stronger than that of Northerners on these points; and it seems to have been honest, though South Carolina politicians alleged that Virginia, having supplied herself with slaves, desired to abolish the foreign slave-trade only in order to become a slave-breeding ground for other States. But everywhere the respect for vested property rights made the idea of "gradual abolition" the controlling principle for some forty years. The State constitution of Vermont (not yet admitted to the Union) in 1777, of Massachusetts in 1780, and of New Hampshire in 1783, abolished slavery; and gradual abolition was secured by statute in Pennsylvania in 1780, in Rhode Island and Connecticut in 1784, in New York in 1799, and in New Jersey in 1804. As the States north of the Ohio and east of the Mississippi were admitted, the provisions of the ordinance of 1787, under which their territorial organizations had been effected, made them free States; and in 1820 slavery was abolished in the Louisiana purchase north of lat. 36° 30′, excepting in Missouri. In 1857 the Supreme Court, in the Dred Scott decision, denied the validity of this last abolition, but its essential feature had been inserted in the constitution of the only State as yet formed in it, Iowa. "Gradual abolition" had thus done all that it could do. It had extinguished slavery wherever the climate had always been against slavery, north of Mason and Dixon's line and the Ohio River; elsewhere it had hardly scratched the surface of the system. Eli Whitney's invention of the cotton-gin in 1793 had increased the export of cotton from 189,316 pounds in 1791 to 63,944,459 pounds in 1807, had made slave-labor profitable in the cotton States and slave-breeding profitable in the border States, and had changed the whole temper of the South on this subject. In 1806, in Congress, Early of Georgia could say, "I will tell the truth: a large majority of people in the Southern States do not consider slavery even an evil. Let gentlemen go and travel in that quarter of the Union, and they will find this to be the fact." In the following year the abolition societies became discouraged, made their national meetings triennial, and soon ceased to meet altogether. The slight remaining abolition sentiment took up the Colonization Society, founded in 1816, with the design, in the North, to assist in abolishing slavery by colonizing free blacks in Africa, and in the South, to rid the country of troublesome freedmen.

For the colonial history of slavery and attempts at its abolition see 6 Bancroft's *United States*, 413–415; Clarkson's *History of the Abolition of the Slave-Trade*, 99; Hildreth's *Despotism in America*, 177–253; H. Sherman's *Slavery in the United States;* Moore's *Slavery in Massachusetts;* Bettle's *Slavery in Pennsylvania;* Goodell's *Slavery and Anti-Slavery;* 1 *Journals of Congress*, 24, 307 (1774–76).

For the "gradual-abolition" period, 1780–1830, see Hildreth and Goodell, above cited; Livermore's *Opinions of the Founders of the Republic on Negroes;* 1 Wilson's *Rise and Fall of the Slave Power;* 1 Von Holst's *United States* (Lalor's translation), 302–408; the authorities cited in Von Holst's notes; Stockwell's *History of Liberia;* and the volumes of the *African Repository*, the organ of the Colonization Society.

Until 1829–30 the abolition idea was representative of a sentiment only, and the remarkable change which then took place in it was due mainly to William Lloyd Garrison, a Massachusetts printer engaged with Benjamin Lundy in printing a "gradual-abolition" newspaper at Baltimore. Garrison first raised the cry of "immediate" abolition, meaning thereby the use of every means at all times towards abolition without consulting slave-owners. He seems to have had from the first a clear perception of the consequences of his new departure. He returned to Boston, established *The Liberator* as his newspaper organ, Jan. 1, 1831, and the New England Anti-Slavery Society a year later, and began a fierce and successful attack upon the orthodox Colonization Society. In December, 1833, an abolition convention at Philadelphia formed the American Anti-Slavery Society, and the abolitionists, with the new and aggressive significance now attached to their name, became a class of national importance. The next five years were their period of storm and stress. Throughout the South the idea of "gradual" abolition disappeared in an instant; the new phase of the anti-slavery feeling was denounced as insulting to the South and dangerous to the continuance of the Union; rewards were offered for the capture of prominent abolitionists; and the slave laws were made more rigorous than they had ever been before. From this time the state of siege, which ceased only in 1865, became the rule in the South. In the North there was a general feeling of sympathy with Southern indignation, and the result was a long series of mob-attacks on abolition meetings and violence in every form. Before 1840 these in reality had exhausted themselves, though they never ceased entirely until 1861.

At first the political action of the abolitionists was confined to petitions to Congress for the abolition of slavery in the District of Columbia. Beyond this Garrison and his radical followers did not desire to go, for they believed the Constitution itself to be a "covenant with death and an agreement with hell," on account of the political power which slave-owners had obtained under it. They refused to vote, hold office, or recognize the Government as having any authority over them; they attacked the national church organizations as supporters of slavery; and in every political sense they were a law unto themselves. In 1839–40 the "political abolitionists," who considered the Constitution in no sense a pro-slavery instrument, and who wished to use and not defy it and the churches in the anti-slavery work, seceded and formed the "American and Foreign Anti-Slavery Society." In political contests they took the name of the "Liberty party." In 1839 they nominated James G. Birney of New York and F. J. Lemoyne of Pennsylvania for President and Vice-President, but polled only 7059 popular votes, mainly in Western New York. In 1844, substituting Thomas Morris of Ohio for Lemoyne, they polled 62,300 votes, and these, being taken mostly from Clay's vote, gave Polk the electoral vote of New York by a plurality, made him President, and secured the annexation of Texas and the addition of nearly 400,000 square miles of slave soil to the United States. This startling result ended the independent action of the Liberty party in national politics.

Hitherto the anti-slavery feeling had been regarded as a plaything: it had now shown itself to be a possible political weapon, and skilful hands were ready to wield it. In the Northern Democratic party there was a strong anti-slavery element and a veteran political leader, Van Buren, and both had been defeated in the Democratic convention of 1844. Alike only in their common defeat, they joined forces in 1848 to avenge it, and the Liberty party subsided into the motley host. The whole took the name of the FREE-SOIL PARTY (see that title). Even after its defeat by the compromise of 1850, Free-Soilers, such as Sumner, Chase, and Hale, were sent to Congress by coalitions of Democrats and Free-Soilers, and these fell into the Republican party on its appearance in 1854–55. But throughout these mutations the abolitionists remained in, but not of, whatever party they joined. To them the essential object in view was not so much the exclusion of slavery from the Territories, or the repeal of the Fugitive Slave law, as the abolition of slavery throughout the United States. The only present means to this end was a constant assistance of fugitive slaves to escape to Canada through the "underground railroad," a series of stations in private houses in which the fugitives were fed, clothed, and provided with concealment and information. In the Kansas difficulties of 1855–58 the abolitionist feeling took the semi-warlike shape of arming intending immigrants; and in October, 1859, it went to the extremity of aiding John Brown in his attempted slave insurrection at Harper's Ferry.

The authorities for this period are still Wilson's and Goodell's works, above cited; 2 Von Holst's *United States*, 80–147, and 3: 563–597; and 1 Greeley's *American Conflict*. A very interesting work is May's *Recollections of our Anti-Slavery Conflict*, from which Wilson and Greeley have drawn. See also Jay's *Inquiry into the Character of the Colonization Society* and *Miscellaneous Writings on Slavery;* Garrison's *Speeches;* Johnson's *Life of William Lloyd Garrison;* Frothingham's *Life of Gerrit Smith;* Lovejoy's *Life of Lovejoy; History of Pennsylvania Hall;* Tappan's *Life of Tappan;* Still's *Underground Railroad;* Redpath's *Life of John Brown;* Giddings's *History of the Rebellion;* 1 Draper's *Civil War in America*, 311–338; Helper's *Impending Crisis in the South;* Cairnes's *Slave Power;* and Cobb's *Historical Sketch of Slavery*. For the various shades of anti-abolition feeling see Lunt's *Origin of the Late War;* Fowler's *Sectional Controversy;* 4 Tucker's *United States*, 428–433; *Buchanan's Administration*, 9–86; Harris's *Political Conflict in America*, 67–83; Pollard's *Lost Cause*, 54–64; 2 Stephens's *War Between the States*, 27–102; 4 Calhoun's *Works*, 542–573 (his speech of March 4, 1850).

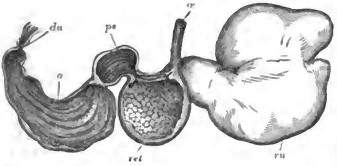
In the Federal Convention, Aug. 21, 1787, Luther Martin of Maryland, in asking for a prohibition of the slave-trade, gave as a reason that "slaves weakened one part of the Union, which the other parts were bound to protect; the privilege of importing them was therefore unreasonable." And in a passionate speech the next day on "this infernal traffic" George Mason of Virginia spoke thus strongly: "The evil of having slaves was experienced during the late war. Had slaves been treated as they might have been by the enemy, they would have proved dangerous instruments in their hands; but their folly dealt by the slaves as it did by the Tories." He mentioned the dangerous insurrections of the slaves in Greece and Sicily, and the instructions given by Cromwell to the commissioners sent to Virginia, to arm the servants and slaves in case other means of obtaining its submission should fail. In an intended speech in February, 1836, and in another delivered April 14, 1842, John Quincy Adams had fully developed the power of the Federal Government, in a case of military necessity arising either under foreign invasion or domestic insurrection, to emancipate negro slaves. This inherent weakness of a slaveholding community in war was forgotten by both parties in 1861. Eleven slaveholding States seceded in defiance of all the possible evils of war; and in July, 1861, Congress almost unanimously resolved that the war was not prosecuted with any purpose of interfering with the "established institutions" of the seceding States, and that it ought to cease as soon as the supremacy of the Constitution and the laws and the perpetuity of the Union were secured. But it was inevitable that a continuance of the war should result in an attack on slavery, sooner or later, for no belligerent will willingly fight with one hand tied behind it. Little by little the process went on, through the successive stages of confiscating the property in slaves employed against the Government, forbidding the army to return fugitive slaves, abolishing slavery in the Territories and in the District of Columbia, and authorizing the employment of negro soldiers, up to the Emancipation Proclamation. Two subordinate generals, Fremont in Missouri and Hunter in South Carolina, had already issued proclamations abolishing slavery within their fields of command, but their action was disavowed by the President, whose special desire was for compensated abolition. In December, 1862, he proposed to Congress three constitutional amendments, to compensate States which should abolish slavery before the year 1900, and to colonize free negroes out of the country; but these were not considered. Gradual abolition, however, was made a part of the constitution of West Virginia in 1862 and Missouri in 1863, and immediate abolition in the constitution of Maryland in 1864.

President Lincoln's preliminary proclamation of Sept. 22, 1862, and his final proclamation of Jan 1, 1863, purported to abolish slavery in the seceding States, excepting the thirteen parishes of Louisiana and the seven counties of Virginia then within the Union lines. But the difficulty, by reason of which the validity of the proclamation has been severely criticised, is that in the specified territory President Lincoln had no constitutional power as President, and no physical power as commander-in-chief, to free a single slave. The difficulty may be avoided, however, by considering the final proclamation as a mere rule of action for Federal commanders, and as taking effect in future as the Federal lines should advance; and this was probably the sense in which its author intended it. The advance of the Federal armies and the State action above referred to had practically abolished slavery everywhere except in Kentucky and Delaware when the thirteenth amendment to the Constitution, which had been proposed by Congress, April 8, 1864, in the Senate, and Jan. 31, 1865, in the House, was ratified by thirty-one of the thirty-six States, and declared in force Dec. 18, 1865. The purpose of the *Liberator* and the American Anti-Slavery Society was thus accomplished by the workings of the very Constitution which they had declared to be a covenant with death and an agreement with hell.

Wilson and Greeley are still the chief authorities for this period, but a very useful compilation is Wilson's *Anti-Slavery Measures in Congress, 1861-65.* See also McPherson's *Political History of the Rebellion*; 12, 13 *United States Statutes at Large*, and the 6073 titles in Bartlett's *Literature of the Rebellion*, most of them relating, directly or indirectly, to the abolitionist movement. (A. J.)

See Vol. I. p. 53 Am. ed. (p. 51 Edin. ed.).

ABOMASUM, the last division of the stomach of a ruminant, which has at least three compartments, and usually four. The stomach of any typical ruminant, as an ox or sheep, is divisible into two principal parts, cardiac and pyloric, each of which is again divisible into two. The extreme cardiac end of the cardiac part is dilated into an enormous sac of irregular form, the *rumen* or paunch, which communicates with the second cardiac subdivision, much smaller, called the *reticulum* or honeycomb. The mucous membrane of the rumen is raised in a vast number of close-set papillæ, while that of the reticulum is thrown into multitudinous crossed folds enclosing many polygonal cells. These two cardiac portions are eaten under the name of "tripe." The reticulum communicates by a narrow aperture with the *psalterium*, or first pyloric subdivision, the mucous membrane of which is thrown into numerous folds of sufficient extent to reach nearly across its cavity, which latter is thus converted into a set of parallel lamellæ with intervening clefts. When cut lengthwise, the lamellæ fall apart like the leaves of a book, whence the butchers' term "manyplies," and the fanciful name "psalterium," or "hymn-book," of anatomists. The fourth compartment of the stomach, being the second pyloric subdivision, is the *abomasum*, or rennet, comparatively long and narrow, with a soft, glandular, highly-vascular mucous membrane, in but few longitudinal folds; thus of an entirely different character from that of the other three portions of the stomach, and completing the chymification of the food. (E. C.)



Stomach of a typical ruminant (sheep). *œ*, œsophagus, entering cardiac portion of stomach; *ru*, rumen; *ret*, reticulum; *ps*, psalterium; *a*, abomasum; *du*, duodenum, the intestine beginning at the pyloric extremity of the abomasum. (After Huxley.)

ABOUT, Edmond François Valentin, French novelist, dramatist, and philosopher, born at Dieuze, Feb. 14, 1828. He studied with unusual success at the College of Charlemagne, and in 1848 took the prize of honor in the course of philosophy. He then entered the École Normale, from which, in 1851, he was transferred to the French School at Athens. While in Greece he published his *Island of Egina* ("L'Ile d'Égina"), which appeared in Paris in 1854. With the materials amassed there he issued in 1855 his *Contemporary Greece* ("La Grèce contemporaine"). This was afterwards printed in the "Railway Library" and translated into several languages. His severity in this work towards Greece and her people amounts to abuse, and we have the first-fruits of a polemic disposition and a sharp pen displayed in his later works. In the *Revue des Deux Mondes* appeared his *Tolla*, a book of an autobiographic character, and although he took care to say that it was suggested by an Italian work called *Vittoria Savorelli*, the critics, who were glad of an opportunity to punish this free-lance, accused him of shameful plagiarism. He was thenceforth confronted by enemies whom he was bold in meeting. In 1856 he wrote a comedy called *Guilléry*, which encountered such a storm of opposition that, after two representations, it was withdrawn from the stage. But his pen was not paralyzed. In the same year he produced the novel *Les Mariages de Paris*, and, gaining admission into the columns of *Figaro*, he was very bold in his retorts upon his detractors. He wrote under the *noms-de-plume* of Valentin de Quévilly and Vicomte de Quévilly. In the *feuilleton* of the *Moniteur* he issued some of his best novels: *Le Roi des Montagnes* (1856), *Germaine* (1857), *Les Échasses de Maître Pierre* (1857), *Trente et Quarante* (1858), and *Nos Artistes au Salon.* After a residence in Rome he published the work by which he is best known out of France, called *The Roman Question* ("La Question romaine"), which, if partisan in its nature, was timely and instructive. In the journal called *L'Opinion Nationale* he wrote a spirited series entitled "Letters of a Young Man to his Cousin Madeline," and a short play, *Risette; or, The Millions of the Mansarde.* His more ambitious drama, entitled *Gaetana*, was produced at the Odéon in 1862, but failed of success through the efforts of his numerous enemies, literary, religious, and political: on this account, however, it was well received in the provincial towns, and contributed to the author's reputation. In 1860 he produced a political paper entitled *The New Map of Europe and of Prussia* ("La Nouvelle Carte d'Europe et de Prusse"); in 1861, *Ces Coquins d'Agents de Change, L'Homme à l'Oreille cassée, Le Nez d'un Notaire;* in 1862, *Le Cas de M. Guérin.* Then followed in rapid succession, from 1862 to 1869, *Madelon, Dernières Lettres d'un bon Jeune Homme, Le Progrès, La Vieille Roche, Le Mari imprévu, Le Marquis de Lanrose, Causeries* (2 vols.), *L'Infame, Les Mariages de Province, L'A B C du Travailleur*, a popular manual of political economy; *Le Fellah*, souvenirs of Egypt. Employed on the literary staff of the *Gaulois* in 1868, he became soon after one of the editors of *Le Soir*, and as a special reporter in the field during the Franco-Prussian war he confronted hardships and dangers with the armies. On the conclusion of the war he espoused the cause of the Republic, and was ardent in his attachment to Thiers. He was arrested in Alsace by the German Government in 1872 on the charge of high treason against the German emperor, but on international grounds he was liberated without trial. A few weeks after he issued his *Alsace*, which overflows with French patriotism. With the collaboration of M. de Najac he produced numerous dramas, not of as much interest as his other works. In 1858 he had been decorated with the ribbon of the Legion of Honor, of which he was made an officer in 1867. In 1870 he was a candidate for membership in the French Academy; there were two vacancies, but the opposition was strong, and he failed for both. He had married, in 1846, Mademoiselle de Guillerville of Roncherolles, near Rouen. Many of his political works and novels have been translated into English. (H. C.)

ABRAHAMSON, Werner Hans Frederik (1744–1812), a Danish author, was born April 10, 1744, in Schleswig. His works comprise historical, æsthetic, and critical essays, Runic investigations, and translations of sagas. He published, with Ráhbok and Nyerup, five volumes of Danish mediæval ballads. He also wrote original poems and popular songs, and took part in the preparation of the Danish hymn-book. His works are all imbued with a patriotic spirit. He died at Copenhagen, Sept. 22, 1812.

ABSENTEEISM is the living at a distance from one's estates. Public opinion and common feeling always have regarded the practice as pernicious to the estate and the country whose revenues are consumed at a distance. But J. R. McCulloch and other English economists perceived that this feeling is in conflict with the proposition of the economists, that the general welfare is best secured through each individual following the bent of his own inclination and doing as he will with what is his own.

The question is important chiefly in its bearings on the controversy on free trade. Mr. McCulloch, treating of Ireland, maintains that the resident landlord exchanges his income for Irish commodities or their equivalent, bringing them into his house in Ireland and consuming them there: the absentee landlord also, through the merchants who furnish him with bills, exchanges his income for Irish commodities, which, or their equivalents, he brings into or consumes in his house in London or Paris. "It is never, in short, by sending abroad revenue, but by sending abroad capital, that nations are impoverished." "Should absentees return, there would be an increased demand for commodities or labor both to the extent of three or four millions sterling; but that would be balanced by an equal diminution in the foreign market."

In discussing these statements let us assume, for convenience, that the rents of estates owned in Ireland by absentee landlords are four millions sterling, and the value of the crops on those estates twenty millions sterling. This would leave to the tenants sixteen millions sterling to reward them for their labor and to pay the interest on the capital they have invested in farming. If the merchants who furnish the landlords with bills expend the four millions in the purchase and export of raw produce, the effect will be the same as though one-fifth of the crop had been exported, and, so far as the industry of Ireland is concerned, this fifth might as well have been burned. No advantage is derived from it by either Irish capital or Irish labor. Both must confine their gains to the remaining four-fifths. The country from the start will be the poorer by the four millions sterling it might have used in home consumption. It will not become poorer and poorer so long as the rents are not raised; it will be poor at a fixed rate.

If the landlords and their families, while living in idleness, consumed just this share of the Irish harvests as food, it might be a matter of indifference whether they did this at home or abroad. But, in fact, their fourth is converted into money which pays for the services of a vast variety of persons and in buying a great number of material objects other than food. The landlords, therefore, in using these articles and employing these services exclude the rest of the community from the enjoyment of less than one-fourth the value of their rents—from no more, indeed, than the value of the raw material which enters into the commodities they consume. The rest—three-fourths or more—pays for services in the production of elaborated commodities or direct services.

Resident landlords, consuming their rents in Ireland, procure the working up of their four millions sterling of raw commodities into finished products of far greater value, say eight millions sterling. Of this sum, seven millions sterling or more go to the support of other classes. But with landlords non-resident the whole amount of raw material paid in rent is lost to the country by its exportation in that condition. Were the export one of finished commodities, one-half of their value represents payment for labor and capital expended in their elaboration, and this half will be expended on other products, half of it going for the payment of labor and capital, and so on. The export of finished products means the creation of an effective demand for other products within the country, and the finer the export the greater the demand. That of raw products results in no such advantage.

When it is said that nations grow poorer only by the export of capital, and not by sending abroad their revenue, the true nature of national wealth is ignored—that wealth is not measured by the exchangeable value of a nation's property, but by its power to command the necessaries, conveniences, and luxuries of life, and is measured by the power to consume. That power stands in close and immediate relation to the interior development of productive industry and the growth of the power of association among the people.

That the indirect effects of a landlord's residence are beneficial is conceded even by those who defend the economic thesis we have been disproving. It is admitted that his higher standard of comfort, his superior intelligence, his example of improvement, his public spirit, may be highly useful; and he has social opportunities of exciting competition in the best direction. The existence of a landlord class is beneficial to society partly for these reasons; and it is not to be wondered that the practice of non-residence has created a demand for the abolition of the class and the creation of a peasant proprietorship.

In this discussion we have assumed that residence implies the consumption of native products elaborated by native labor. If the four millions sterling are spent in British or French products imported into Ireland, the country derives no more benefit from them than if its landlords had chosen to live in London or Paris. Here it is that defence of absenteeism coincides with the theory of free trade. In Ireland, to recur to our example, this is unhappily true. The country is supplied with manufactures from every corner of Europe, especially from England, but has almost none of its own. The benefits which its people would derive from the superior tastes and the higher ideas of comfort among its wealthier classes are not attained. Popular instinct stamps the landlords as a useless excrescence, and proposes to rid the country of those from whose superior culture it might derive great indirect benefits. (G. B. D.)

ABSOLON, JOHN, an English artist, was born in 1815. He began as a miniature-painter, but about 1836, after having studied for some time at Paris, he devoted himself chiefly to water-color painting. He, has been an active member of the New Water-Color Society and of the Institute of Painters in Water-Colors, and has frequently exhibited at the British Institution and at the Royal Academy. Absolon's works are excellent representatives of that tendency in English art which Taine condemns, or at least disparages, with the word "literary." Nearly all his best pictures are representations of incidents described by popular authors, or are of that anecdotal character which appeals to the spectator's knowledge of the commonplaces of life rather than to his appreciation of its poetical moments. His works are usually pleasing in matter and in manner, and they are frank and honest statements of their subjects, which suggest nothing more than they tell in a language that all can readily understand. Among his best-known pictures may be mentioned The Vicar of Wakefield, Joan of Arc, The Field of the Cloth of Gold, The First Night in a Convent, Captain Macheath Betraying his Mistress, Threading the Needle, The Courtship of Miles Standish, The Courtship of Gainsborough, Home, The Missal, Facing the Storm, Ready for the Ball, Rescue of St. Arthur and Miss Wardour, and After a Walk to Islington. (W. J. C., JR.)

ACADEMIES OF SCIENCE OF AMERICA. In treating of American scientific institutions a brief allusion to the rise and progress of science in the Western hemisphere may not be undesirable. American science is chiefly confined to the United States, though Canada has of late years shown some commendable activity in this direction. There are museums and academies of science in the principal cities of Spanish America, as Mexico, Buenos Ayres, etc., and printed results of their observations are issued by the University of Chili,

See Vol. I. p. 67 Am. ed. (p. 68 Edin. ed.).

the Argentine Scientific Society of Buenos Ayres, the Mexican Society of Natural History, etc., yet these can scarcely claim to rival the scientific productions of the United States' institutions. These latter have been, until recently, confined to the older seaboard cities, but culture in this direction is now spreading through all the States, and each of the large cities of the West has its young but ardent and rapidly growing academy of science. In many of the smaller towns minor associations exist, and the foundations for a broad and liberal culture in the knowledge of the facts and laws of Nature have been deeply laid.

For many years after the settlement of America the conditions requisite for scientific research were absent. Americans are yet, to a considerable degree, pioneers in a new world, and have not fully achieved that physical conquest of the country which occupied the time and exhausted the mental energy of the earlier inhabitants. Even when growing wealth and increasing leisure in the older cities yielded some of the necessary conditions for the pursuit of a knowledge of Nature, the other conditions were wanting. There was no incitement to scientific study, and there were no schools for scientific education, no collections of scientific books and materials, and no demand for scientific information. Thus, while the first important steps in the progress of modern science in Europe were being taken, the minds and the time of the citizens of America were occupied in the development of a new continent. The earlier American scientists, such as Dr. Franklin and Count Rumford, probably gained their first thirst for scientific research in Europe. Franklin spent several of his youthful years in London, and Rumford was American only in birth; his scientific labors were wholly European.

The discoveries, the theories, and the active organizing spirit of Benjamin Franklin were the first important incitements to American research. The reflection of his European fame back to his native shores roused a spirit of emulation, which was fostered and encouraged in the institutions which he founded. Some of these institutions yet exist as the oldest and most active of American organizations for the pursuit of knowledge. To him, therefore, may be fairly given the title of the "Father of American Science."

It is not our purpose here to attempt any review of the progress of science in America, and it will suffice to say that the desire for scientific knowledge, once awakened, incited many able men to the study of Nature, particularly as displayed in the Western hemisphere. This desire for knowledge has widened and deepened, and has produced an activity of research into scientific facts and collections of scientific material rapidly approaching, if not equalling, those of the older institutions of Europe.

It must be admitted, however, that American science has as yet been principally confined to its primary field, the collection of facts and of material for study. This, though an absolutely necessary first step in all useful scientific progress, is by no means its final stage. Science has its two separate fields, induction and deduction. In the growth of science deduction preceded induction—a vitally false method, since great edifices of ideas were based upon fancies, and were destined to sink into ruin at the first touch of facts. The true scientific method is the discovery of the facts of Nature, followed by the collocation of these facts, and the deduction thence of natural principles. This is the mode of investigation now pursued, it being evident that a knowledge of facts, though useful in itself, has its highest utility as an aid to the discovery of principles.

American science is as yet almost wholly inductive. European science has long been largely deductive. The fame of the greatest European scientists is based much more largely upon their discovery of principles than upon their observation of facts. Newton, Laplace, Young, Humboldt, Cuvier, Darwin, Spencer, and many others who might be named, were active observers, but their reputation rests particularly upon the theories which they promulgated, vast edifices of thought into whose walls fell thousands of facts, as harmoniously combined as are the building-stones in a grand temple. America has as yet produced few deductive scientists, and none whose work fairly compares with that of those above named. The theories of Franklin were based on an imperfect series of facts, and since his day American scientists have devoted themselves almost exclusively to the observation of facts and the collection of materials. Only very recently has there been shown any active disposition to collate these facts and to deduce thence Nature's underlying principles. Some important theoretical views have been advanced, and there are growing indications that American science is on the verge of entering its second stage, and of drawing from the material which it has gathered in a century of active research important additions to man's knowledge of the laws and principles of Nature. In addition to the scientific treasures possessed by the institutions specially devoted to research, the universities of the country are also largely provided with scientific material, and in their classes a new generation of American scientists is being formed, destined, perhaps, to carry forward the science of the Western World to a high level of accomplishment, and to pursue that ardent study of the laws of Nature which is the converging-point of all study of its phenomena.

The oldest scientific institution in America owes its origin to the conception and efforts of Dr. Franklin. It was first advocated by him in a paper dated May 14, 1743, and entitled *A Proposal for Promoting Useful Knowledge among the British Plantations in America.* In the succeeding year (1744) he succeeded in organizing an association called the American Philosophical Society, with Thomas Hopkinson as president, Benjamin Franklin as secretary, and among its members John Bartram the botanist, Thomas Godfrey the mathematician, and other well-known persons. Franklin's time being otherwise engaged, this society languished, and discontinued its meetings after a few years. It was revived in 1767, and reorganized in 1768 as the American Society held at Philadelphia for Promoting Useful Knowledge. Meanwhile, another society was formed in Philadelphia, called the Junto, or Society for the Promotion of Useful Knowledge. Its date of organization is not known, but its preserved records begin Sept. 22, 1758. Possibly, it was a revival of the youthful society of the Junto, established by Franklin in 1727. On Jan. 2, 1769, these two societies united under the title of the American Philosophical Society held at Philadelphia for Promoting Useful Knowledge. Of this society Dr. Franklin became the first president, and was annually re-elected until his death. The American Philosophical Society is still in active existence, and is the oldest of American scientific institutions. Its original object was the promotion of knowledge in general, and such branches in particular as might be of service to the British colonies. The title of this society does not well indicate its present character, since it is almost exclusively scientific in its labors. These are included in a valuable series of published *Transactions* dating from 1789, and of *Proceedings* from 1838 to the present. The society possesses a fine library of about 30,000 volumes.

The Academy of Natural Sciences of Philadelphia is, in several respects, the most important of American scientific institutions. It was organized and its constitution adopted in 1812, and incorporated in 1817. During its seventy years of active labor it has gathered an exceptionally fine museum and a highly valuable library which contains about 30,000 volumes. The library is more complete in respect to natural history than any other in the United States, and is particularly rich in valuable illustrated works. The museum calls for some special reference, its collections in some departments being unsurpassed, not only in this country, but in the world. In the department of conchology its only rival is the British Museum, which somewhat surpasses it in number of nominal species, but is considerably inferior in number of specimens. This department contains 140,000 mounted specimens of shells. In ornithology it is surpassed only by the museum of the University of Leyden. Its collection embraces more than 31,000 specimens of birds, nearly all mounted and displayed. In addition, it has more than 40,000 species of plants, 50,000 species of insects, 65,000 fossils, the valuable Morton cabinet of human crania, etc., the total collection numbering nearly 300,000 specimens. The publications of the academy consist of a series of *Journals* from 1817 to date, and of *Proceedings*, the first number of which appeared in 1841. It has also published seven volumes of *The American Journal of Conchology*. With the academy is now incorporated the American Entomological Society, which has published *Proceedings* from 1861, and *Transactions* from 1868 to date.

The American Academy of Arts and Sciences, located at Boston, ranks next to the American Philosophical Society in date. It was incorporated by act of the Massachusetts legislature in 1780 with the express object of encouraging the study of American antiquities and of the general natural history of the country. It also embraces in its purpose the useful application of American natural productions and the encouragement of all investigations in art and science. The American Academy has made no collection of scientific material, but has a library of 20,000 volumes. It has devoted its energies chiefly to publication, and has issued a valuable series of *Memoirs* ranging from 1785 to date. It also publishes *Proceedings*, the first volume of which appeared in 1846. The academy occupies an apartment in the Boston Athenæum building.

The Boston Society of Natural History was preceded by the Linnæan Society, founded in 1814, and subsequently discontinued. It was reorganized under the above title in 1830, and incorporated in 1831. The object of this society is the general study of natural history, in which it has done some excellent work. It possesses a library of about 18,000 volumes, and an excellent cabinet of natural-history specimens, including 16,000 birds. The collection generally is of great value, and is specially rich in the natural productions of New England and in mineralogy. Its publications consist of *Proceedings*, of which the first volume appeared in 1841, and of the *Boston Journal of Natural History*, dating from 1834.

The Connecticut Academy of Arts and Sciences ranks third in date of American scientific institutions. This academy was organized and incorporated at New Haven, Conn., in the year 1799. One of its main objects, as originally instituted, was the collection of a statistical account of the State of Connecticut, but it now embraces in its scope the whole field of science and the useful arts. It has no library or cabinet, and has not been active in publication, having issued but one volume of *Memoirs* in 1810, and *Transactions* from 1866. Its scientific labors, however, have found an ample field of expression in *Silliman's Journal*.

The New York Academy of Sciences has borne its present title only since the year 1876. It was previously known as the Lyceum of Natural History, which association was incorporated in the city of New York in the year 1818. It possesses a large and valuable library, but its scientific collection, with the exception of its herbarium, was destroyed by fire a number of years ago. The principal collection of natural-history material now in New York is the extensive cabinet possessed by the Museum of Natural History, located in Central Park in that city. The publications of the academy consist of the *Annals of the Lyceum of Natural History*, dating from 1824. These, with the *Proceedings*, commenced in 1873, have borne since 1876 the title of *The New York Academy of Sciences*. The publication of a series of *Transactions* was begun in 1881.

The Peabody Academy of Sciences was organized in 1867, and endowed by George Peabody with the sum of $140,000 for "the promotion of science and useful knowledge" in his native county of Essex, Mass. It is located at Salem, Mass., under the control of trustees. Its publications consist of *Proceedings* and *Memoirs*, which have appeared periodically since 1869.

Of the Western academies, the most active are those at Chicago, St. Louis, Cincinnati, San Francisco, and Davenport. Of these, the San Francisco Academy ranks first in date, having been organized in 1853. It is entitled the California Academy of Natural Sciences, and has done much good work in the natural history of the Pacific region. Its published *Proceedings* date from 1854, in addition to which it has recently issued *Memoirs*. Its library and museum are as yet small, but will probably rapidly increase through the aid of the bequest made to the academy by James Lick.

The Academy of Science of St. Louis was organized in 1856 and incorporated in 1857. Its scope of labors covers the whole field of science, and includes the publication of original papers and the formation of a museum and library. As yet, however, it has not been very successful in the latter purposes. Its published *Transactions* date from 1856.

The Chicago Academy of Science was organized in 1857 and incorporated in 1865. In its object it seeks the increase and diffusion of scientific knowledge by discussion and the collection of material for study. This association has been particularly unfortunate, having been twice burned out. All its possessions were destroyed by the great Chicago fire, yet with commendable activity it has already largely replaced its losses. Its published *Transactions* consist of one volume, covering from 1867 to 1869.

The Cincinnati Society of Natural History was organized in 1870. It is an active institution, and possesses a valuable collection of palæozoic fossils. Its publications consist of *Proceedings* dating from 1875, and of a *Journal* from 1878.

The Academy of Natural Sciences of Davenport, Iowa, organized in 1867, is an active institution, and possesses a very good botanical and ethnological cabinet. It issues *Proceedings*, dating from 1876. It is particularly noticeable from the fact that the funds for the building and the publications of the society were principally raised by the efforts of the ladies of Davenport, many of whom are active members of the society.

The American Association for the Advancement of Science had its origin in an association of American geologists and naturalists which held migratory meetings in different cities from 1840 to 1847. At its meeting in Boston in 1847 it resolved itself into the above-named organization, the constitution being adopted at its meeting in Philadelphia in 1848. It was incorporated as a society by an act of the Massachusetts legislature in 1874, its permanent secretary being located at Salem in that State. The object of this association is, "by periodical and migratory meetings, to promote intercourse between American scientists, to give a stronger and more systematic impulse to research, and to procure for the labors of scientific men increased facilities and wider usefulness." For this purpose an annual public meeting is held, to continue for a week or more, at some place and date decided at the previous meeting. It thus offers an opportunity to read or present for publication papers of scientific interest and for a useful interchange of opinions. It has proved a very active and useful organization, and has published a valuable series of *Proceedings*, dating from 1849 to the present.

The National Academy of Sciences, of somewhat similar character to the above, was preceded by an association named the National Institution for the Promotion of Science and the Useful Arts, organized at Washington, by act of Congress, in the year 1840. Its main object was the collection of scientific material and the establishment of a national museum. It died out after publishing *Proceedings* from 1841 to 1846. The National Academy was incorporated at Washington by Congress in the year 1863. Its main object was to examine and report upon any scientific questions submitted to it by the Government departments, and thus to bring the knowledge of specialists to the aid of the Government when necessary. In such investigations the Government pays the actual expenses, but no compensation. The membership was originally limited to fifty, selected from the scientists of the country. This restriction no longer exists, and the number of members is now nearly a hundred. The society is divided into two classes—one devoted to mathematics and physics, and one to natural history. It holds two stated meetings yearly—one in January at Washington, and one in August at some other city. At these meetings general scientific subjects are discussed. The publications of the National Academy consist of *Annuals* and *Reports* dating from 1863, and of *Memoirs* from 1866.

The Smithsonian Institution, at Washington, is now the most important of American institutions. James Smithson, an English scientist, who died at Genoa in 1829, left by will a bequest to the United States of America "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." The amount of this bequest, when received at Washington in 1838, was $515,169. The institution was founded, in accordance with the terms of the will, by act of Congress in 1846, and the interest of the bequest, amounting to $242,129, was applied to the erection of a suitable building. By judicious management, aided by small subsidiary bequests, the endowment had increased on Jan. 1, 1881, to $719,434.53. It is the intention to limit its increase to $1,000,000. Much of the work of the institution has been in connection with the National Museum, instituted in 1842 to receive the scientific material collected by the Wilkes Exploring Expedition. This museum was placed under the care of the Smithsonian Institution in 1858. Its collection has been increased by the numerous exploring expeditions of the Government, by the material gathered in the geological survey, and by the highly valuable contributions made by foreign Governments to the United States at the close of the Centennial Exhibition of 1876, in addition to the stores gathered by the institution itself. The museum is now closely affiliated with the Smithsonian Institution, though partly supported by annual appropriations from the Government. Its collection is of great value, and is very rich in many departments. It may, as a whole, be ranked with the largest European collections, and in such fields as the ethnology, zoölogy, and mineralogy of the United States it has no rival among the museums of the world. The large library of the institution, which yearly receives extensive additions, has been transferred to, and incorporated with, the National Library.

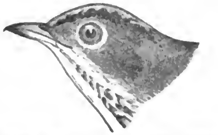
The special and most important labors of the Smithsonian Institution are, however, in another direction. It yields financial aid to important scientific researches. It acts as a medium of international exchanges of books and specimens between learned societies and individuals of the Eastern and Western hemispheres. It supplies great numbers of duplicate specimens to learned institutions, it aids the investigations of specialists by the loan of valuable specimens, and it publishes the results of such researches and other papers of scientific importance in the highly valuable series of works which it issues. These works, which have given the Smithsonian Institution a high standing in the scientific world, consist of *Annual Reports* from 1846 to date; of *Miscellaneous Collections*, begun in 1862, and now numbering 21 volumes; and of *Contributions to Knowledge*, begun in 1848, and numbering 23 volumes. In addition, it issues the publications of the National Museum, consisting of *Proceedings* and *Bulletins*, the *Publications of the Bureau of Ethnology*, and the *Bulletin of the Philosophical Society of Washington*. This institution, with its ample endowment, its special advantages, its skilled corps of laborers, and its bulky and valuable publications, promises to become in the future one of the great scientific forces of the world.

The institutions above described are the more important of the American scientific societies, but there are many others of minor importance, several of them active and useful. Of these may be named the Society of Natural History, of Portland, Maine, incorporated in 1850; the Essex County Natural History Society, of Salem, Mass., incorporated in 1833, and now merged in the Essex Institute; the Albany Institute, organized in 1828; the Poughkeepsie Society of Natural History, organized in 1874; the Buffalo Society of Natural History, organized in 1861; the Elliot Society of Natural History, of Charleston, S. C., organized in 1853; the New Orleans Academy of Science, organized in 1853; the Ann Arbor Scientific Association, of Ann Arbor, Mich., organized in 1875; the Minnesota Academy of Natural Sciences, of Minneapolis, Minn., organized in 1873; the Wisconsin Academy of Science, Arts, and Letters, of Madison, Wis., organized in 1870; the Kansas Academy of Science, organized in 1867, and holding migratory annual meetings; and the Rochester Academy of Natural Sciences, established in 1881. In addition to these are many local institutions; various State cabinets of natural history, some of which are of considerable extent; and societies devoted to some single branch of science. Of these latter may be named the Massachusetts Horticultural Society, incorporated at Boston in 1829, and the American Chemical Society, of New York, organized in 1876. All the institutions here named issue publications, frequently of considerable value.

Of late years the American colleges and universities have been active in collecting scientific material, and much good work in this direction has been done within their walls. The Johns Hopkins University, of Baltimore, Md., has a fully organized corps of scientific professors, and does much original work, whose results are embodied in annual publications. Harvard and Yale are also active in scientific labor. Yale has a Peabody Museum and the valuable Marsh collection of vertebrate fossils. Harvard possesses the important Museum of Comparative Zoölogy and a magnificent herbarium which ranks with the best in the world. Columbia College has an herbarium, probably ranking second in the United States; Princeton College, the fine E. M. Natural History Museum, etc. The noble collections of the Cornell University, at Ithaca, N. Y., and the much older, and in some respects more complete, museum of Amherst College, are worthy of mention.

The scientific institutions herein described, and the course of science which is now becoming an important feature of college study, are what America has to show for a century of scientific progress. They form a broad foundation for its future development. Work of the greatest importance in embryology, histology, comparative anatomy, palæontology, etc., is now being actively prosecuted by specialists throughout the country, the Government is giving abundant aid to special investigations, and American science promises ere long to rival that of the much older and better-endowed institutions of Europe. (C. M.)

ACCENTOR (Lat. *accentor*, a chanter). 1. A genus of oscine passerine birds of uncertain position; by some placed among the thrushes, chats, and warblers of the



Golden-crowned Accentor, *Siurus auricapillus* (natural size).

Old World; by others made the type of a sub-family, *Accentorinæ*, next to the chats (*Saxicolinæ*). 2. Taken as the English name of the hedge-sparrow, hedge-chanter, or hedge-accentor, *A. modularis* of Europe. 3. In the U. S. sometimes used as the English name of species of the sylvicoline genus *Siurus*, the usual song of which is chanted in monotone. (E. C.)

See Vol. I. p. 79 Am. ed. (p. 82 Edin. ed.).

ACCEPTANCE, ACCEPTOR (from the Latin *accipere*, to receive). In the law. generally, acceptance means the receipt of anything in pursuance of a contract on the part of one person to deliver and of another to receive it. Thus delivery and acceptance are, as a rule, necessary to a complete contract for the sale of chattels. From its more general meaning it has acquired in mercantile law the more particular signification of the act of one who promises to pay in money a bill of exchange or draft when it shall fall due, for he thereby becomes the principal debtor on the bill, and, like the maker of a promissory note, undertakes to pay the amount of it at maturity. A bill of exchange being a request by the drawer of it to the drawee, or person on whom it is drawn, to pay a specified sum at a certain time for his (the drawer's) account, the acceptance of it by the drawee creates an obligation on his part to pay it at maturity, and the drawer becomes his surety for its payment. The usual form of acceptance consists in writing the word "accepted" across the bill and signing the acceptor's name. But the acceptance need not be written on the bill, but may be in writing on another paper, and need not necessarily be in writing at all. In England, however, by statute, an acceptance must now be in writing, and similar statutes have been enacted in this country in the States of Alabama, California, Delaware, Kansas, Maine, Michigan, Minnesota, Missouri, Oregon, New York, Pennsylvania, and Wisconsin.

The acceptance may be *absolute*, which is a positive agreement to pay the bill according to its tenor; or it may be made *conditional* upon some contingency, such as the receipt of a particular shipment of goods against which the bill is drawn. But such condition or qualification must receive the assent of all antecedent parties to the bill in order to hold them liable. (S. W.)

See Vol. I. p. 79 Am. ed. (p. 83 Edin. ed.).

ACCIDENT. An accident, in law, may be defined as an unforeseen and injurious occurrence not attributable to mistake, neglect, or misconduct. The principles of the common law make ample provision for relief from the consequences of accident in certain cases. Where, for example, written instruments are lost, parol evidence to prove their contents will generally be admitted in a court of law. Resort, however, is usually had in cases of accident to courts of chancery, where relief may often be obtained in accordance with the well-settled principles of equity jurisprudence. A court of equity will not administer relief in cases of accident (1) where there is an adequate remedy at law; (2) where the person seeking relief has by his own gross neglect or misconduct contributed to or caused the accident; (3) where the equity of the party against whom the relief is sought is equal or superior to that of the party invoking the aid of the court; (4) where the relief sought is an entire release from an obligation to perform an express covenant entered into by the suitor, the performance of which, owing to some intervening events, has become unexpectedly harsh or burdensome. Subject to the qualifications above stated, equity will relieve in many instances of accident where otherwise damage might ensue.

Where title-deeds have been lost, equity will in certain cases decree a re-execution of them. Where a bond or other instrument for the payment of money has been mislaid, the creditor may assert his rights in equity and recover the amount of his debt, indemnity being usually required to protect the debtor against any contingent liability growing out of the subsequent discovery of the instrument.

The defective execution of powers will be aided in equity in favor of certain persons. Relief will also be afforded where boundaries have become by accident confused, where there has been an accidental omission to indorse a promissory note, and in certain other cases of less frequent occurrence.

The peculiar jurisdiction of equity with regard to penalties and forfeitures is also supposed to be traceable in its origin to the head of accident. The failure to make the payment or perform the act in default of which the penalty or forfeiture has been provided was presumed to have been occasioned by accident, and the interposition of a court of equity for the relief of the person in default was thus justified. (L. L., JR.)

ACCIPITRES (Lat. *accipiter*, a hawk; *ad* and *capio*, I take, seize), an order or sub-order of birds, birds of prey. 1. In its larger (ordinal) acceptation the term is equivalent to the *Raptores* of Illiger and Cuvier or *Rapaces* of Temminck, and covers all the rapacious birds, as the owls and American vultures, as well as the hawks, etc. In this sense it corresponds with the AETOMORPHÆ of Huxley (which see). 2. In its lesser signification, as a sub-order of *Raptores*, it includes only the diurnal birds of prey, excluding the owls (*Striges*) and also the American vultures (*Cathartides*) and African secretary-bird (*Gypogeranides*).

Taken in the (usual) ordinal signification, *Accipitres* furnish the following characters: The bill epignathous (hooked), and furnished with a soft cere, in or at the edge of which the nostrils open, and feet not zygodactyle. This expression is diagnostic, for the parrots, the only other birds with hooked and cered bill, are zygodactyle. There are two carotid arteries; the syrinx, when developed (there is none in *Cathartides*), has but one pair of intrinsic muscles. The sternum is ample and deep-keeled, its posterior margin being doubly or singly notched or fenestrate on each side, or entire, with central emargination; the furculum ankylosed or not. Angle of mandible not recurved; maxillo-palatines united to an ossified septum; basipterygoid processes present or absent. Hallux always present, usually valid and insistent; outer toe reversible in some cases, never permanently reversed. Ambiens muscle present (except in *Striges*). Cœca coli and tufted oil-gland present (except in *Cathartides*). Plumage after-shafted or not. Nature altricial, yet ptilopaedic, the young being downy, yet long reared in the nest. The alimentary canal varies with the families, but differs from that of vegetarian birds in adaptation to an exclusively animal diet. In the higher accipitrine types the whole structure betokens strength, activity, and ferocity, carnivorous propensities and predaceous nature. Most of the smaller or weaker species feed much upon insects, others more particularly upon reptiles and fish, others upon carrion; but the majority prey upon other birds and upon mammals. To this end the claws, no less than the beak, are specially adapted by their development into great talons. These weapons of offence and defence are as a rule of large size, strength, curvature, and acuteness, and also peculiar in being convex on the sides, gradually narrowing to the point, and little or not excavated underneath. The inner claw is larger than the outer, and the hinder one is not smaller than the middle front one; all are very flexibly jointed, so that they may be strongly bent underneath their digits, carrying to an extreme the prehensile power of the feet. The legs are muscular and largely free from the body, feathered to the suffrago or beyond; when unfeathered the tarsal envelope is variously scutellate, reticulate, granular-rugose, etc. The wings are ample, and, as usual in birds below *Passeres*, the secondary coverts are long and numerous, covering three-fourths or more of the folded wing. The tail, though very variable in shape, has twelve rectrices (with rare exceptions).

Representatives of this order are found in every part of the world. They include *four* types of structure, of more classificatory value than that attaching to families. One of these, *Gypogeranides*, consists of the single species (genus and family) *Gypogeranus serpentarius*, the serpent-eater or secretary-bird of Africa; it shows a curious grallatorial analogy, being mounted on long legs like a crane and having several important structural modifications. The other three are the *Striges*, or owls; the *Accipitres* proper, embracing all the hawks, eagles, etc., and the Old-World vultures; and the *Cathartides*, or American vultures. The last-named are more different from the others collectively than these are from one another. The three groups being well represented in North America, we offer the following scheme of classification:

- Feet scarcely raptorial, with weak, blunt, lengthened, and little curved or contractile claws. Hind toe elevated, not more than half as long as outer toe, with small claw; middle toe lengthened; outer toe not versatile; front toes all webbed at base; basal joint of middle toe longer than either of the succeeding ones. Nostrils large, perforate. Bill little raptorial, lengthened, and somewhat contracted in its continuity; tomia never lobed or toothed; tip blunt, little hooked. Head largely naked. Index digit with a large claw. No syrinx, cœca, after-shafts, or tufted oil-gland. Ambiens muscle present; femoro-caudal present or absent; semitendinosus and its accessory present . CATHARTIDES.
    - Diurnal; gressorial; feed upon carrion . *Cathartidæ*.
- Feet highly raptorial, with large, strong, sharp, curved contractile claws. Hind toe not elevated, lengthened, more than one-half as long as outer toe, with large claw; outer toe often versatile; front toes with slight basal webbing between outer and middle, or none. Nostrils small, imperforate. Bill short, stout, seldom contracted in its continuity, tomia often once or twice lobed or toothed, tip sharp, much hooked. Head feathered, completely or in greatest part. Syrinx developed, with one pair of intrinsic muscles. Cœca present. Plumage with or without after-shafts. Ambiens present or absent. Femoro-caudal present. Semi-tendinosus and its accessory absent. As a rule saltatorial, and kill their prey.
    - Physiognomy not peculiar; no great lateral expansion of the cranium or thickening of its walls with diploë; eyes looking sideways; no facial disc, or only an imperfect one; base of bill not hidden by antrorse appressed feathers. Nostrils pierced wholly within the cere. No external ear-conch. Tomia of bill usually toothed or lobed. Outer toe not shorter than inner one, and rarely versatile. Basal joint of middle toe longer than the next. Feet (with rare exceptions) in greatest part or entirely bare of feathers, scutellate or reticulate, or both; toes always bare and scaly. Sternum commonly single-notched or single-fenestrate on each side behind; sometimes entire. Oil-gland tufted. Plumage compact, usually after-shafted; flight audible. Ambiens muscle present. Habits diurnal . . . . ACCIPITRES (proper).
        - Outer toe not reversible; plumage usually after-shafted . . . . *Falconidæ*.
        - Outer toe reversible; plumage without after-shafts . . . . *Pandionidæ*.
    - Physiognomy peculiar by reason of great lateral expansion, lengthwise contraction and diploic thickening of the cranium, which is often unsymmetrical. Eyes looking forward, surrounded by a radiating disc of modified feathers, in front antrorse, appressed, hiding base of bill. Nostrils usually at edge of the cere. A large external ear-conch often developed. Tomia of bill never lobed or toothed. Outer toe completely versatile, shorter than inner toe. Basal joint of middle toe not longer than the next, much shorter than the penultimate one. Feet usually feathery or bristly to or on the toes. Oil-gland nude. Plumage without after-shafts, soft and lax; flight noiseless. Ambiens absent. Habits nocturnal . . . . STRIGES.
        - Sternum entire behind, with central emargination; furculum ankylosed. Middle claw pectinate. Facial disc complete, triangular (embracing only the "barn-owls," which are related to *Steatornithidæ* and *Caprimulgidæ*) . . *Aluconidæ*.
        - Sternum double-notched or fenestrate behind; furculum free. Middle claw not pectinate. Facial disc circular when complete (ordinary owls), *Strigidæ*.

(E. C.)

ACCOMPLICE, in criminal law, one who is in some way concerned in the commission of a crime, though not as a principal. It was formerly doubted whether a prisoner might be convicted on the unsupported evidence of an accomplice. This doubt has been resolved in the affirmative. It has, however, become the practice for the judge strenuously to advise the jury to acquit unless the evidence of the accomplice be corroborated either by other testimony or by the attendant circumstances. (L. L., JR.)

See Vol. I. p. 86 Am. ed. (p. 91 Edin. ed.).

ACCOUNT, in law, a statement of the mutual demands in the nature of debt and credit arising out of contracts or some fiduciary relation. In mercantile law, when an account is made up to a certain time and a balance struck, and this has been examined and accepted by the parties expressly or by acquiescence, it is an *account stated*. Books of the original entries of the charges for goods sold and delivered in mercantile transactions are valuable as evidence of the sale and delivery, being the memoranda made at the time of the transaction, and are generally, in this country, admissible as evidence in courts of law, with the testimony of the person who made the entries, to prove *primâ facie* the contract under which the plaintiff seeks to recover. So an account stated may form the basis of a suit to recover the balance shown by it to be due to the plaintiff. Account forms a distinct branch of equity jurisdiction concurrently with courts of law, but extending also (1) to dealings so complicated that they cannot be adjusted in a court of law; (2) to the existence of a fiduciary relation between the parties; (3) to discovery of facts in the knowledge of the parties or the production of papers relating to their rights; and (4) to the appropriation of payments. Both in the courts of law and equity the disposition is to refuse to interfere with stated accounts. (S. W.)

See Vol. I. p. 88 Am. ed. (p. 93 Edin. ed.).

ACETIC ACID (formula, $C_2H_3O.OH$). Acetic acid was the only acid with which the ancients were acquainted, and frequent references to vinegar, its impure form, with more especial reference to its solvent power, are found in Pliny, Livy, and Plutarch. This vinegar of the ancients was an impure wine-vinegar, and the alchemists were the first who prepared pure acetic acid by distillation. Wood-vinegar was also known in the time of Glauber, who refers to it in 1648. Lavoisier first showed that acetic acid is a product of the oxidation of alcohol. Acetic acid at the present time is made from one of two sources—either as a product of the oxidation of alcohol or by the destructive distillation of wood. Under the first head we have the production of vinegar from wines as carried out in wine-growing countries, from malt liquors as carried out in England, or from cider and fruit-juices as carried out in this country. In these several cases the process of its preparation, known as the "acetous fermentation," is largely but not solely one of atmospheric oxidation, as a vegetable organism, the *Mycoderma aceti* (see FERMENTATION, Vol. IX.), plays an important part. Under the first head also we have the "quick-vinegar" process, whereby weak spirit containing 5 to 7 per cent. of alcohol is rapidly changed into vinegar. In this case casks are used loosely filled with beech-wood or deal shavings, and the spirit, slightly warmed, is made to slowly trickle through the cask. The large surface exposed allows of an abundant action of atmospheric oxygen, and this, at the temperature of 97°–104° F. which is kept up, rapidly changes the alcohol into acetic acid. Under the second head we have the production of what is known as "pyroligneous acid," or wood-vinegar. This is produced chiefly from oak- and beech-wood, and is in its crude state a very complex mixture, containing, besides acetic acid, propionic acid, acetone, wood-spirit or methyl alcohol, and other impurities. The acetic acid is obtained by neutralizing the crude pyroligneous acid with lime, removing the brown acetate of lime which forms, and after heating it sufficiently to carbonize the tarry impurities, thereby changing it to gray acetate, distilling with sulphuric or hydrochloric acid. The acetic acid is thus liberated in a pure state, although in a dilute form. Concentrated acid is gotten by distilling the fused sodium salt with strong sulphuric acid. Among the more important *acetates*, or salts of acetic acid, are—sodium and ammonium acetates, both of which are used in medicine; calcium, aluminum, and iron acetates, which are used in calico-printing as mordants, the solution of the second being known as "red liquor," and of the last as "black liquor;" lead acetate, both the normal and the basic salt, the former as "sugar of lead" and the latter in solution as Goulard's extract, quite extensively used in medicine; and cupric acetate, which as basic salt is extensively manufactured under the name of "verdigris." The ethers or organic salts of acetic acid are also technically important, as several of them, including ethyl and amyl acetate, are used in the manufacture of artificial fruit-essences.

In the year 1880, according to the census, there were manufactured in the United States 7,233,009 lbs. of acetate of lime, valued at $166,092. (S. P. S.)

ACHENBACH, Andreas, a German landscape-painter, was born at Hesse Cassel, in 1815. He studied at the Düsseldorf Academy under Schirmer, and a picture entitled The Academy of Düsseldorf first brought him into notice as an artist of promise and good gifts. He has been a great traveller, and his landscapes are reminiscences of the most striking scenery of Europe from Norway to Italy. Of his important pictures may be mentioned A Storm at Vlissingen, Hildesheim, Fish at Ostend, Storm and Flood on the Lower Rhine in 1876, A Norway Torrent, Fishing-boat at Sunset, A Storm Clearing Off, Coast of Sicily, and The Return of the Fishermen at Evening. Achenbach is a diligent student of Nature, and has, in common with most German landscape-painters, a liking for strong contrast and bold effect. His pictures are uneven in quality, but the best of them are very admirable performances. Many of his important works are in the Pinakothek at Munich, and good examples of his style are to be found in nearly all the best collections of Germany and the United States. In addition to his oil-paintings, Achenbach has made many pictures in water-color, and he has practised etching and lithography. He is a knight of the order of Leopold, a chevalier of the Legion of Honor, and a member of the academies of Berlin, Amsterdam, and Antwerp. He has received a number of medals at important exhibitions. (W. J. C., JR.)

ACHENBACH, Oswald, a German artist, was born at Düsseldorf in 1827. He is a brother of Andreas Achenbach, and received his instruction from him. This artist has devoted himself chiefly to Italian subjects, such as A Fête at Genazzano, Villa Torlonia near Frascati, Vesuvius at Twilight, Market-place at Amalfi, The Festival of St. Anna at Ischia, A Storm Effect at Naples, and The Environment of Naples. Oswald Achenbach, although his works are strongly marked by the characteristics of the Düsseldorf school, is a more refined painter than his brother, and his best pictures suggest Calame and his school of landscape art rather than the performances of the Düsseldorf artists. He is particularly skilful in the management of groups of figures, while his atmospheric effects are frequently very charming. (W. J. C., JR.)

See Vol. I. p. 91 Am. ed. (p. 97 Edin. ed.).

ACID, a chemical term which may be applied in a general but loose way, or in a strictly scientific way which is at the same time thoroughly comprehensive as well as correct. The general application of the word is to any chemical compound, whether binary or ternary, whether containing oxygen or not, whether containing hydrogen or not, that neutralizes the substances called bases. Thus, the term acid is applied in this loose way to CO_2, SO_2, and SO_3, as well as to H_2CO_3, H_2SO_3, and H_2SO_4, and similarly to HCl, HBr, HI, and HF. SiO_2 is often called silicic acid, because when fused with soda, lime, or litharge it forms a silicate. The precipitated H_2SiO_3 is then called hydrated silicic acid, to distinguish it from the former.

This undoubtedly arose from the prevalence of Gmelin's views as perpetuated for many years in what is now called the "old notation," whereby the oxide of an electro-negative element was called the acid, instead of the acid-forming oxide or acid anhydride, as it really is. That HCl and the hydrogen compounds of the halogens were acids, even as gases, has never been disputed. With the development of organic chemistry, when organic acids had to be formulated which contained both replaceable or basic hydrogen and hydrogen unreplaceable or belonging to the radical, the old methods of nomenclature broke down, and a new, truer, and more comprehensive system had to be adopted.

This is found by going back to the earlier electro-chemical views of Berzelius, and looking strictly at the electro-positive or -negative character of the elements for a solution of the question as to whether they are acid- or base-forming. And as these characters are not fixed and absolute for all conditions of combination, we need look only at the question as to which part an element or group of elements plays in the particular compound. From this standpoint it is possible to establish a definition that shall include all true acids and explain all cases, whether real or seeming, in which we appear to have the reaction known as acid.

We now define an acid as *the compound of an electro-negative element or group of elements with hydrogen;* and this definition is sufficiently comprehensive to include all true acids, either inorganic or organic. At the same time, we recognize the fact that oxides of electro-negative elements largely constitute those groups which by combination with hydrogen form acids.

How is this combination with hydrogen brought about? The case of the several halogen acids is simple. They are direct binary compounds of the halogen element with hydrogen. In other cases it is by the union, either directly or indirectly, of the negative oxide with water or hydrogen oxide, so that the hydrated acid of the old nomenclature is the true acid of the new.

The simplest class of acids are the so-called "halogen acids," where hydrogen is directly combined with the electro-negative element, as in HCl, HBr, HI, and HF. In all the reactions in which these acids enter they simply exchange hydrogen for metal, forming thereby binary haloid salts. Thus,

$$HCl + KOH = KCl + HOH$$

is an example where the hydrogen displaced from the acid goes with the hydroxyl of the base to form water. Again,

$$(HCl)_2 + CaO = CaCl_2 + H_2O$$

is an example where the hydrogen displaced from the acid unites directly with the oxygen of the oxide to form water. Or the halogen acid may be made to decompose a salt of a weaker acid, as

$$(HCl)_2 + CaCO_3 = CaCl_2 + H_2CO_3 \text{ or } H_2O + CO_2,$$

in which the displaced hydrogen would unite with the electro-negative group CO_3 to form the free carbonic acid H_2CO_3, which, being unstable at ordinary temperature, breaks up into H_2O and CO_2, an electro-negative oxide or anhydride.

The next class of acids are those in which hydrogen is combined with the electro-negative element only indirectly or by the aid of oxygen, making an electro-negative group, as it is termed. In this category belongs the greater number of acids. Here great care must be taken to note the valence of the electro-negative group, for upon this depends the number of hydrogen atoms that it is capable of uniting with, or, as it is conveniently expressed, the basicity of the acid. The electro-negative element which constitutes the foundation of the molecular structure may vary in its valence, giving us a series of acids with perhaps the same number of basic hydrogen atoms, but with a different number of oxygen atoms, which either saturate the electro-negative element or link hydrogen to it, as the case may be. Thus, sulphur, an electro-negative element, forms a series of acids according to the valence displayed by it in the several cases, and according to the part the oxygen of the compound plays, whether simply linking or partly linking and partly saturating. We will give the formulas and the molecular structure of this set as illustrative of the class of acids referred to:

Hyposulphurous Acid (Hydro-sulphurous of Schützenberger),

$$H_2SO_2 \text{ or } H-O-S-O-H,$$

in which the negative group is SO_2, and the oxygen has only the linking function.

Sulphurous Acid,

$$H_2SO_3 \text{ or } O=S\begin{array}{l}-O-H\\-O-H,\end{array}$$

in which the negative group is SO_3, and the oxygen is partly saturating and partly linking oxygen.

Sulphuric Acid,

$$H_2SO_4 \text{ or } \begin{array}{r}O=\\O=\end{array}S\begin{array}{l}-O-H\\-O-H,\end{array}$$

in which the negative group is SO_4, and the oxygen is partly saturating and partly linking.

Other common acids of this class are—

Hypochlorous acid,	$HClO$	or	Cl'	$-OH$,
Chlorous	"	$HClO_2$	or	$Cl'''O-OH$,
Chloric	"	$HClO_3$	or	$Cl^{v}O_2-OH$,
Perchloric	"	$HClO_4$	or	$Cl^{vii}O_3-OH$,
Nitrous	"	HNO_2	or	$N'''O-OH$,
Nitric	"	HNO_3	or	$N^{v}O_2-OH$,
Phosphoric	"	H_3PO_4	or	$P^{v}O-(OH)_3$,
Metaphosphoric	"	HPO_3	or	$P^{v}O_2-OH$,
Pyrophosphoric	"	$H_4P_2O_7$	or	$\begin{array}{l}PO\left\{\begin{array}{l}OH\\OH\end{array}\right.\\ \quad\;\; O\\PO\left\{\begin{array}{l}OH\\OH,\end{array}\right.\end{array}$
Carbonic	"	H_2CO_3	or	$C^{iv}O-(OH)_2$,
Silicic	"	H_2SiO_3	or	$Si^{iv}O-(OH)_2$.

In all these cases the hydrogen of the acid is connected to the electro-negative element by oxygen, constituting with it the group hydroxyl. Upon the number of hydrogen atoms so connected, or, in other words, the number of hydroxyl groups, depends the basicity of the acid. If hydrogen occur in the formula not replaceable by metal, we assume that it is not so connected. Such cases are common among organic acids when the hydrogen either belongs to the electro-negative group itself or is attached to it as characteristic of the class of compounds called aldehydes, and hence is called aldehydic hydrogen. Among inorganic acids we have two compounds that probably are of this latter character. They are hypophosphorous and phosphorous acids. In the case of these two acids the basicity of the acid does not agree with the number of hydrogen atoms they contain. Thus, hypophosphorous acid H_3PO_2 is only monobasic, and phosphorous acid H_3PO_3 is dibasic. In explanation of this anomaly their structural formulas are written

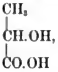
$$PO\left\{\begin{array}{l}H\\H\\OH\end{array}\right. \text{ and } PO\left\{\begin{array}{l}H\\OH,\\OH\end{array}\right.$$

respectively, when the number of hydroxyl groups at once shows the true basicity.

A third class of inorganic acids are those in which the characteristic or fundamental element is not always electro-negative, but in its union with oxygen forms groups either electro-negative or electro-positive, according to the valence displayed by it in the particular case. Thus, chromium may form electro-positive or base-forming groups in the case of its lower oxides, or an electro-negative group when occurring as chromium trioxide CrO_3. Examples of this kind are the chromates, which are the salts of chromic acid H_2CrO_4; the manganates, derived from manganic acid H_2MnO_4; the permanganates, derived from permanganic acid $HMnO_4$; the stannates, derived from stannic acid H_2SnO_3.

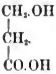
Metals which are ordinarily quite strongly electro-positive may in the presence of a very strong base figure as electro-negative or acid-forming in the combinations with these strong bases. Thus, the evolution of hydrogen from the action of zinc upon potassium hydrate solution is explained on the assumption of the formation of a potassium zincate or the solution of aluminum hydrate in strong alkali by the formation of an alkaline aluminate. The same metal is sometimes assumed to exist in both electro-positive and electro-negative conditions in one combination. Thus, red lead, which, when decomposed by nitric acid, yields lead nitrate and lead peroxide, is considered to be a plumbic plumbate or compound of dyad lead as base and tetrad lead as acid-forming element. A similar case is also found in the case of antimony, which is generally electro-negative, but forms a very stable compound Sb_2O_4 ($Sb'''SbO_4$), antimony antimonate, derivable from antimonic acid H_3SbO_4.

Organic acids, frequently very complex in formula, may still be brought under the simple definition of acids given above. Indeed, the definition may be made still narrower in their case. They are compounds of electro-negative groups with replaceable hydrogen, or rather with hydroxyl, as oxygen always links the hydrogen to the rest of the formula. They are made more complex, however, by the fact that these electro-negative groups contain the same elements, carbon, hydrogen, and oxygen, as other groups acting electro-positive, and are indeed formed from these latter by oxidation. So that an organic acid is distinguished by its containing an oxidized radical as distinguished from the alcohol or unoxidized radical, which acts electro-positive or basic. Thus, acetic acid $C_2H_3O.OH$ is derived by oxidation from ethyl alcohol $C_2H_5.OH$ and benzoic acid $C_6H_5.CO.OH$ from benzyl alcohol $C_6H_5.CH_2OH$. The molecular structure of this oxidized radical may vary very greatly, but its hydrate will still be an acid. Indeed, we may have two acids of the same ultimate formula, the sole difference between them being that the atoms constituting the oxidized radical are differently arranged in the two. Thus, we have two varieties of lactic acid $C_3H_6O_3$, the molecular formula of the one (the lactic acid of fermentation) being



$$\begin{array}{l}CH_3\\ |\\ CH.OH,\\ |\\ CO.OH\end{array}$$

while the other (sarco-lactic acid) is



$$\begin{array}{l}CH_2.OH\\ |\\ CH_2.\\ |\\ CO.OH\end{array}$$

The presence of the group CO.OH (carboxyl) has been sometimes assumed to be characteristic of an organic acid, but it is now admitted that this is not essential. Whether an organic hydrate is to act as alcoholic (or basic) or as acid, seems to depend simply on whether the hydroxyl attaches itself to a carbon atom already linked to oxygen or not. The oxygen with the carbon atom and the hydroxyl may make the group CO.OH, or it may be otherwise grouped.

(For the secondary characters of acids, and also the physical tests by which they are generally recognized, see original article on ACIDS.) (S. P. S.)

ACKNOWLEDGMENT, in law, the act of one who has executed a deed in going before some competent officer designated by statute and declaring the same to be his act and deed. The term is also used to indicate the certificate appended by the officer to the deed, which sets out the manner and fact of the acknowledgment.

In England it is not the practice to acknowledge deeds; in the United States the custom is universal. The functions of an acknowledgment are in the United States twofold: (1) to authorize a deed to be offered in evidence without further proof of its execution; (2) to enable it to be recorded.

The power to take acknowledgments is by law vested in different persons in the various States. Generally, it may be said that any judge of the courts or court officer, mayor or other chief magistrate of a city, magistrate, alderman, justice of the peace, or notary public is authorized to take acknowledgments.

The usual form of acknowledgment is for the person executing the deed to appear before the appropriate officer and to declare that the instrument is his act and deed. In most of the States, however, the acknowledgment of a deed by a married woman is a somewhat more elaborate ceremony. The woman is examined separate and apart from her husband, and declares that the deed is her own voluntary act, without any coercion or compulsion on her husband's part.

In order to entitle a deed to be put in evidence without further proof of its execution, or in order to enable it to be recorded, the certificate of acknowledgment must affirmatively show that all the requisites of the particular statutes in force in the State have been substantially complied with.

The term "acknowledgment" is also used in law to indicate an admission, particularly an admission of a debt due, so clear, explicit, and unconditional as to remove the bar of the statute of limitations. (L. L., JR.)

ACLAND, LADY HARRIET (1750–1815), was a daughter of the earl of Ilchester, and was born Jan. 3, 1750. Her maiden name was Christiana Henrietta Caroline Fox Strangeways, but after her marriage in Sept., 1770, to John Dyke Acland, eldest son of Sir Thomas Acland of Devonshire, she was generally known as Lady Harriet Acland. Her husband was a member of Parliament for Callington, Cornwall, and in 1774, while still holding his seat in Parliament, entered the army. Becoming major of the Twentieth Foot in the next year, he was chosen by Gen. Burgoyne to accompany his expedition against the American colonies. Reaching Canada in June, 1776, Major Acland left his wife in Montreal, but she twice rejoined him in camp, and nursed him till restored to health. Then, refusing to be separated from him, she accompanied the advance of the army, though her husband's command was at the front. At the second battle of Saratoga, Oct. 7, 1777, he was shot through both legs and taken prisoner. As soon as she heard of his capture she obtained a letter from Gen. Burgoyne, and, accompanied by Rev. Edward Brudenel and a few others, sailed down the Hudson to the American lines. She was courteously received, and a few days later Gen. Gates sent her to Albany, whither her husband had been conveyed. When he recovered they visited New York and formed very favorable impressions of the people. Major Acland, being exchanged, returned to England, and in 1778 he fought a duel at Bampton Down with an officer who had aspersed the character of the Americans. At the time of the duel he caught a severe cold, which terminated in a fever, and he died at Pixton Hall, Oct. 31, 1778. Lady Harriet never married again, and through the rest of her life could not refer to her husband without tears. In her youth she was noted for gracefulness and delicate beauty; in later life she is said to have suffered from cancer, though she concealed the fact till her death, which took place at Tetton, July 21, 1815. Her *Letters and Journals*, giving an account of her experiences in America, have been published. For a long time her adventures furnished a favorite subject for pen and pencil, and several romantic additions were made to her story without foundation in fact. One of these was, that after the death of Major Acland she was married to the chaplain who had escorted her from the British to the American army. (See articles by William L. Stone in the *Magazine of American History*, iv. 449, and in *Lippincott's Magazine*, xxiv. 452.)

ACLAND, HENRY WENTWORTH, M. D., F. R. S., D. C. L., fourth son of Sir Thomas Dyke Acland, Bart., was born in 1815, and educated at Harrow and Christ Church, Oxford. In 1841 he was elected to a fellowship at All Souls. In 1848 he took the degree of M. D. at Christ Church, having been previously appointed Lee's reader in anatomy. In 1849 he became physician to the Radcliffe Infirmary. During this period, with the aid of several able assistants, particularly Profs. Beale and Melville and Mr. Charles Robertson, he made the valuable Christ Church physiological series, now in the Oxford University Museum. He became in 1858 Regius professor of medicine, and in 1860 accompanied the prince of Wales to America as his medical attendant. In 1866 he was appointed a member of Mr. Gathorne Hardy's "cubic-space commission," and in 1869 of the royal sanitary commission. Since 1858 he has acted as representative of the University of Oxford in the medical council, has been president of the British Medical Association, and president of the physiological section of the British Association. He published a treatise on *The Plains of Troy* in 1839, and a valuable *Memoir on the Visitation of Cholera in Oxford in 1854*. In addition to these he is the author of numerous treatises on medical, sanitary, and scientific subjects.

ACONITINE. Aconitine, as met with in pharmacy, is of somewhat uncertain composition, the name having been applied to an amorphous alkaloid, or at best to a mixture of amorphous and crystallizable bases, extracted from *Aconitum napellus* and from mixtures of that and other species.

According to Wright, who with several colaborers has worked for years upon these roots, *A. napellus* contains a highly crystallizable alkaloid of the formula $C_{33}H_{43}NO_{12}$, to which the name "aconitine" properly belongs. It also contains in smaller amounts pseudaconitine, another active alkaloid which is crystallizable, but yields mostly amorphous salts. Both the aconitine and pseudaconitine are decomposed by the action of mineral acids, alkaline solutions, or simply by the action of water in sealed tubes, according to the reactions,

$$\begin{array}{ccccccc} C_{33}H_{43}NO_{12} & + & H_2O & = & C_7H_6O_2 & + & C_{26}H_{39}NO_{11}. \\ \text{Aconitine.} & & & & \text{Benzoic acid.} & & \text{Aconine.} \end{array}$$

$$\begin{array}{ccccccc} C_{36}H_{49}NO_{11} & + & H_2O & = & C_9H_{10}O_4 & + & C_{27}H_{41}NO_8. \\ \text{Pseudaconitine.} & & & & \text{Dimethyl protocate-} & & \text{Pseudaconine.} \\ & & & & \text{chuic acid.} & & \end{array}$$

Both of these alkaloids, *aconine* and *pseudaconine*, are said to have been found free in the roots of aconitum. Some roots contain in addition a nearly inert, bitter base termed picraconitine $C_{31}H_{45}NO_{10}$ and another amorphous alkaloid.

According to Wright and Luff, *Aconitum ferox* contains chiefly pseudaconitine, with a little aconitine and an amorphous alkaloid. According to the same authorities, Japanese aconite contains a new base, Japaconitine $C_{66}H_{88}N_2O_{21}$, which resembles aconitine very closely, having the same fusing-point (185° C.), but yielding different decomposition-products upon treatment with acids or alkalies.

Aconitum heterophyllum, lastly, contains *atisine*, an amorphous alkaloid of intensely bitter taste. Broughton, its discoverer, assigns to it the formula $C_{46}H_{74}N_2O_5$. The drug is devoid of acridity and does not contain aconitine. (S. P. S.)

ACOUSTICS. To the statement of the principles and facts of the science of ACOUSTICS, as given in the *Encyclopædia Britannica*, the following important details and new discoveries should be added:

See Vol. I. p. 93 Am. ed. (p. 100 Edin. ed.).

Atmospheric Influence.—Experiments in signalling with sonorous instruments on the coast during fogs have led to a preference for the siren over the trumpet, and for the trumpet over the whistle. They have disproved the notion that sounds travel farthest in fine weather. On the contrary, sounds are heard at greater distances through fog, snow, hail, or rain. Perfect stillness and uniform density and temperature are found to be most favorable conditions for the transmission of sound-waves. The velocity of sound (which is seven hundred times greater than that of a breeze) is not sensibly affected by the wind. It is sometimes conveyed better against the wind or at right angles with it than when both proceed in the same direction.

Sound travelling with the wind is refracted to the earth, and travelling against it is elevated several hundred feet. Sound so lost may be heard again far off, being returned to earth by a contrary current, or (from the spreading of the tone) it may arrive from another point. Sounds unheard on the deck of a vessel may be clearly distinguished on the masthead. This spreading of the tone in all directions on the horizon is so marked a peculiarity that a fog-trumpet is heard nearly as well at equal distance behind as in front. Concave reflectors therefore are of little service.

During early experiments the most conflicting results were frequently obtained and generally accepted theories disproved. Prof. Tyndall, on finding the sound obstructed in clear weather, assumed that streams of air differently heated or saturated in different degrees with aqueous vapors rendered the atmosphere flocculent to sound; that invisible acoustic clouds incessantly passed through the air, intercepting the sound, wasting it by innumerable reflections, as light is wasted in an ordinary cloud; and therefore that days of extraordinary acoustical transparency may be followed by days of extraordinary acoustical opacity. Archibald Forbes, in *My Experiences of the War between France and Germany* (vol. ii. pp. 285–289), noted that the cannonading in the distance, which was well heard on cold, damp, and foggy days, in extremely fine weather was unheard. Such stillness reigned that it was generally believed the firing had ceased.

Prof. Henry, who for many years experimented on fog-signalling, and gave us the best fog-signals in the world, recorded his doubt of the above conclusions that the screening effects were due to abnormal conditions, and believed that sound will pass through these "regions of silence" freely enough in an opposite direction.

As his experiences from 1865 to 1877 were not given to the world, but recorded in purely official documents, it may be well to state that in the appendix to the report of the Lighthouse Board for the fiscal year ending June 30, 1874 (p. 116), he says that a flocculent condition of the atmosphere, due to the varying density produced by the mingling of invisible aqueous vapor, is a true cause of obstruction in the transmission of sound—a fact borne out by the principles of wave-motion as well as by experiment—but that he is far from thinking this to be the efficient cause of the phenomena under consideration. That a flocculent condition of the atmosphere should slightly obstruct the sound is therefore not difficult to conceive, but that it should obstruct the sound-ray in one direction and not in an opposite, or in a greater degree in one direction than in another, the stratum of air being the same in all cases, is not credible.

Aërial Echoes.—It is believed by some that the strong and prolonged aërial echoes are produced in the clearest air by acoustic clouds; and it is maintained by others that such echoes have been clearly heard when there was no acoustic cloud in the direction of the prolongation of the axis of the fog-trumpet; that these echoes have been heard in all weathers and under widely differing circumstances; that they become fainter, and not stronger, when approached, although they are more continuous, increasing from five to twenty minutes; and that these, in common with many other phenomena said to have been observed, await fuller investigation.

The atmosphere evidently exercises a selective choice upon the waves of sound continuously, sometimes favoring tones of deep pitch and sometimes those of greater altitude.

Harmonic Echoes.—It may be an explanation of harmonic echoes that the fundamental tones are weakened or lost, while the overtones are heard in full strength or reinforced. When the original sound is required to be of a character that is known to be rich in such overtones, and the intervening space is a wooded valley, this view may receive some confirmation. At Maidenhead railway-bridge, however, the sounds are said to be gradually raised, and the echoes repeat the letter *s* more distinctly than is usually the case.

Velocity of Sound in Different Media.—The velocity of sound through metals at 20° C. or 68° Fahr. is as follows:

Lead	4,030	feet per second.
Gold	5,717	" "
Silver	8,553	" "
Copper	11,666	" "
Platinum	8,815	" "
Iron	16,822	" "
Iron wire (ordinary)	16,130	" "
Cast steel	16,357	" "
Steel wire (English)	15,470	" "

As a rule, these speeds are diminished by augmented temperature. Iron, within certain limits, is an exception. At 100° C. it reaches 17,386; at 200° C. it falls to 15,483. The double echoes in coal-mines are due to varying velocities. The velocity of sound in coal is estimated at 7000 feet per second. The sound of each stroke of the miner being transmitted through the coal, and also much more slowly through the air, has given rise to the story of his ever-heard but never-seen colaborer.

Sound in Buildings.—Annoying echoes in buildings may be modified by the hanging of curtains or the use of matting to absorb the tone at those points from which it is reflected. The new cathedral of St. Finn Bar at Cork in Ireland, the nave of which is of great height in proportion to the width, had a troublesome echo. Several thin wires, barely visible from below, were stretched across the building at certain points, and proved to be perfectly successful in destroying the echoes. They are now commonly used for this purpose, for the experiment is easily made, and the number of wires may be readily increased until the adjustments are satisfactory. At the new cathedral of St. Patrick in New York six wires, near the west gallery, are sufficient. In buildings intended for music the ceiling should not meet the wall at right angles, and other means should be taken to prevent sudden checks to the progress of the sound-waves and the consequent rebounding. Nor should the ceiling be perfectly flat; it should have the form of the inverted hull of a ship or the roof of the mouth, which is a resonant air-cavity. A certain amount of resonance being desirable, although echoes are distressing to both musicians and orators, it is well to arrange to have it in excess when the hall is empty, for the dresses of the audience absorb very much tone. The erection of a gallery across the hall opposite the stage will sometimes destroy an echo, or a speaker by directing his voice under such a gallery may evade it. Well-practised speakers and singers learn to adapt themselves to rooms by so directing their voices to particular points. Speakers who are free to use whatever tones they choose sometimes adapt the pitch of their voices to the various halls in which they speak. A clergyman accustomed to his own church preaches therein with less effort than in a strange building.

Although much stress is laid upon the advisability of having music-rooms planned in accordance with particular proportions as regards length, breadth, and height, so that all the dimensions may be multiples of some unit of length, yet it appears that the influence of a building in deadening or reinforcing and enhancing tones depends as much upon the materials used as upon the form adopted. Choir-singers attached to various cathedral establishments in England have frequently noticed the good effect of music sung in almost any old building in the precincts, whatever its proportions. It seems to have escaped observation that in all such cases the buildings are of solid stone or good brick with mortar so well made as to be stronger than the bricks themselves, and the wood is extremely hard and close-grained.

In a diving-bell sounds are very loud, on account of the compression of the air. The intensity of sound depends on the density of the air where it is produced, and not on that where it is heard, unless the latter air-volume be the denser. A partly deaf person will hear better in a gallery than on the ground floor, whether the speaker be elevated or not.

Sound Compared with Light and Water.—There are analogies between the laws that govern the progress of sound, light, and water. Sound in its uniformity of speed and in its decay by radiation resembles light, but in its mode of deflection, reflection, and absorption it partly resembles light and partly water. Sound, like water, can be conducted through tubes, etc., as light cannot. Light travels in straight lines from its source, and consists of distinct impulses succeeding one another and forming waves. In this it resembles sound. Waves of water, when they strike at a more acute angle than 45°, are not perfectly reflected. When they strike at a more acute angle than 30°, they seem to travel along the bank or other surface against which they have struck. Waves of sound, however, are not only reflected, but also radiated, and often reinforced, by the sympathetic vibrations of bodies which they strike while being transmitted.

The mathematical theory of undulations shows that the waves of sound bend around obstacles, and produce more or less effect within the geometrical shadow, while light-shadows are more sharply defined. This may result from their difference of pitch, since we find that the acoustic shadows cast by notes high in pitch are more distinct than those cast by deep tones. Sound resembles light also in a property like translucency, since some bodies give passage to only a portion of the sound-waves.

The Polarization of Sound.—Prof. S. W. Robinson of the Ohio State University, having examined the nature of vibrations in extended media, asserts that if they are produced from the action of a remote single centre of disturbance, they can only be longitudinal, even in light; that vibrations will be to some extent transversal when due to two or more centres of disturbance not in the same line, as when two or more independent co-existent systems of undulations combine into one, or when a simple system is modified by such lateral disturbance as a reflection or a refraction; that undulations to be in a condition called polarized probably consist of vibrations which are transversal, and that no necessity exists for assuming vibrations to be transversal in front of a polarizer. His method of experiment is ingenious, and the results are very interesting, but further experiments are necessary before a satisfactory knowledge of the matter can be gained. Prof. Robinson, however, believes that the longitudinal character of the vibrations of sound has been proved by the repeated reflections he gained from the surfaces of membranes separating coal gas and air. A diminution in intensity was produced according to the relative positions of the membranes, analogous to reflections of light from a series of glass plates. When the membranes used become, from any cause, too slack or too tense, the results are disappointing. Their tension must be carefully adjusted.

The Note of a Building.—It frequently happens that an organ carefully regulated in every particular in the factory, and designed to fill with tone a given number of cubic feet in a church of which the materials and shape are known, on being erected in the edifice has one particular note reinforced in a remarkable degree, so that it seems almost impossible to reduce its power that it may be uniform in strength with others. This note is possibly one whose sound-wave is correlated to the unit of measurement of the building.

Sensitive Flames.—The most sensitive flame is a conical one having a deep-blue base and yellowish apex, obtained from ordinary gas-jets by placing a wire gauze (having 32 meshes to the lineal inch) about two inches above a Sugg's steatite pin-hole burner and lighting the gas above the gauze. At the least noise the flame roars and sinks so as to become almost invisible. It dances well to an ordinary musical snuff-box, but is not particularly sensitive to other vowels than *a* and *u*. The roaring is attributed to the greater proportion of air that mixes with the gas before it passes the gauze. It is then an explosive mixture that burns. It is hardly safe to excite flames within safety-lamps in mines. A flame produced by coal gas in a holder under a pressure of ten inches of water, and issuing from a steatite jet having a circular orifice 0·04 inch in diameter yields a flame that is sensitive to vibrations beyond the limit of hearing. By continuously raising the pitch of a Galton whistle, the flame becomes more and more agitated on passing the point of audibility; at every puff of the whistle the flame falls from 24 inches to 8, roars, loses its luminosity, and when viewed by a moving mirror presents a multitude of ragged images, indicating a state of rapid, complex, and vigorous vibration. This effect is produced when a distance of fifty feet divides the sound and the flame.

Beats.—Players on stringed instruments and tuners of pianofortes have noted the phenomenon of beats from single strings. That these are not caused by defects in the strings is sufficiently well proved. The beats are caused by some unknown peculiarity in the structure of the instrument, such as the shape and position of the *f* holes in a violin with reference to the grain of the wood of the belly, want of correlation, etc. This is called the "wolf," and generally occurs on D or F of the violoncello. Many mysterious phenomena are peculiar to pianofortes.

There are three other kinds of beats—viz., those obtained from unisons, from other concords (such as fifth, third, etc.), and those formed by harmonics which are perfectly in tune clashing with tempered intervals.

Approach Caused by Vibration.—Prof. Guthrie-Challis and Prof. J. Clerk Maxwell have experimented to determine the cause and conditions of the observed fact, that when a vibrating tuning-fork or vibrating disc is held near a piece of suspended cardboard the latter has a tendency to approach the fork or disc. This is not due to the establishment of permanent air-currents. The approach begins from distances far exceeding the range of Faraday's surface whirlwinds. The vibrating fork displaces air. The effect of apparent attraction is caused by atmospheric pressure which is due to pendulatory dispersion. The pressure of the air on the suspended body is less on the side nearest the fork than on the opposite side.

Mercadier's Music Register.—A wire suspended by narrow strips of caoutchouc is soldered at one end to a small plate of brass which is placed between the sounding-board of a violin or other stringed instrument and the foot of the bridge. The other end is fixed to a heavy stand in such a manner as to communicate its vibrations to a feather which is also fixed to the stand. In this way the vibrations are of greater amplitude than they would be if the feather were attached directly to the wire. The feather is so placed as to record its motions on a smoked cylinder which may be turned by the hand. A tuning-fork is made to record its vibrations simultaneously on the cylinder as a chronograph, so that the cylinder need not be turned with a uniform motion. The resulting wave-marks may be measured with the aid of a micrometer.

Stereoscopic slides have been employed by Preece and Stroh to throw into perspective the very complicated vibration-curves of sonorous bodies.

Miniature Whirlwinds.—If some lycopodium or other impalpable powder (such as that found in puff-balls or any fungus yielding very fine brown dust) be sprinkled with sand on a vibrating plate, it will collect at the very points that the sand avoids. Were the experiment performed *in vacuo*, the powder would mix with the sand, for it is the upward and downward movement of the air in obedience to the vibratory action that causes the dust to dance over those portions of the plate where the action is greatest, and eventually to subside in heaps away from the nodal lines.

Recent Researches.—During the past ten years the science of acoustics has made very great advances. It has been demonstrated that the pitch of sounds is raised if the vibrating body is approaching the hearer, and *vice versâ*. This is the basis of Prof. Doppler's theory of the colored stars. Prof. Mayer raised a fork a minor third by rapid rotation. A jet of water descending from a circular orifice is found to consist of a succession of drops which may be analyzed by the electric spark, and like flames be caused to emit a musical sound and respond to extraneous sounds.

The resonator of Helmholtz has aided materially in many forms of research. In value and use it is analogous to the microscope. The invention of the megaphone, microphone, topophone, and harmonic telegraph of Elisha Gray, the translating phonograph, the electro-motograph, musical telephone, and the singing and speaking telephone by Edison, and the general use of telephones of varied forms and powers, form important steps of progress in applied acoustics.

Actual Vibration Numbers.—The four methods of finding the actual vibration numbers of notes described by Dr. Robert Smith of Cambridge University in his elaborate treatise on *Harmonics* (London, 1759), and the formula given by Woolhouse in his work on musical intervals, are now superseded. They were set aside on account of their liability to errors which could not be easily eliminated. The siren of Dove, though valuable to acousticians for general use, is not sufficiently accurate or delicate for particular purposes.

When great exactness is required, the new chronoscope of Schultz is employed. It consists of a metallic cylinder blackened by smoke, which is made to revolve so close to a point attached to one of the prongs of a tuning-fork that the vibratory motions of the latter may be traced upon it. The cylinder is made to revolve by machinery at uniform speed, although alterations in the rate of revolution would not vitiate the result. The only difference caused by such variations would be shown in the amount of space occupied by the curves representing each vibration, and not the number of these recorded in the given time. This chronoscope is used during artillery practice at West Point. The fork being regularly excited, the pendulum of a clock is arranged so as to touch a spring and thus send an electric spark to the recording cylinder. By this device the vibrations that have been recorded in a given space of time are marked off. The interval during which a cannon-ball passes through two targets is similarly marked off by sparks, and the vibrations are counted afterwards in like manner. There generally remains a fraction of a vibration. By the aid of a micrometer this fraction is accurately measured on the cylinder, for each vibration may be, in the first place, divided into twenty parts, and each of these parts again into one hundred parts. By thus subdividing one complete cycle or vibration of a tuning-fork making 250 vibrations per second, calculations may be conveniently made in terms as small as the five-hundred-thousandth part of a second. It is easy to see that by employing a fork of higher pitch (say, B natural, the middle line of the treble staff, with 500 vibrations per second) this interval of time could be as easily subdivided into one million parts. In consequence of Prof. Mayer's discovery that a variation of 1° Fahr. caused a difference of ·0125 in a fork producing 256 vibrations per second, and a difference of ·023 in another making 512 vibrations, and other slight variations, the fork is now frequently tested, and elaborate contrivances are devised to prevent the slightest inaccuracy.

Sound from Radiant Energy.—The photophone is an instrument for the production of sound, even from non-conductors of sound, by the action of an intermittent beam of white light. It is thus proved that sonorousness is a property of all matter. The loudest sounds are produced from substances in a loose, porous, spongy condition, such as cotton wool, worsted, fibrous materials generally, cork, sponge, etc., and also from those that have the darkest or most absorbent colors.

When a beam of sunlight falls upon lampblack, the particles, being thus heated, expand, and cause a contraction of the air-spaces or pores among them. When the light is cut off, the converse process takes place. The action is somewhat like that of repeatedly filling a sponge with water and squeezing it.

Prof. Graham Bell made successful experiments with solids, liquids, and gaseous matter, the sounds produced being sometimes audible all round a large room. He found that the vapors of the following substances were highly sonorous in the intermittent beam: water vapor, coal gas, sulphuric ether, ammonia, amylene, ethyl bromide, diethylamene, mercury; and that the loudest sounds were obtained from iodine and peroxide of nitrogen.

The names "thermophone," "photophone," and "actinophone" are applied to instruments for the production of sound by thermal, luminous, or actinic rays respectively. "Radiophone" signifies an apparatus intended for utilizing any form of radiant energy. When the color of the light is changed the sonority is also changed; thus, hard-rubber shavings, which will sing in red, orange, yellow, and green, refuse to sing at all in blue, indigo, or violet. Green silk will sing in red, but not in indigo. Coal gas, in common with iodine vapors, sings very lustily; hence the presence of fire-damp may be thus detected. (S. A. P.).

ACRELIUS, Israel (1714–1800), a Swedish clergyman, author of a history of New Sweden, was born at Osteraker, Dec. 25, 1714. He graduated at the University of Upsal, and was ordained in 1743. He was appointed by the consistory of Upsal to the pastorate of the Swedish church at Christina (Wilmington), and commissioned with the general charge of the Swedish churches on the Delaware as their provost in June, 1749. He arduously devoted himself to his task, improved the condition of his parish, attended to the affairs of the other Swedish churches, preached in Swedish and English, and collected much information on the state of the Lutheran churches in America. At a conference of ministers at New Providence in 1753 he read a Latin essay "On the Origin and Progress of the German Evangelical Congregations in Pennsylvania and the Adjacent Countries," which was printed in the twentieth volume of the *Acta Historico-Ecclesiastica*. At his request he was relieved of his charge in America in 1756, and appointed to the pastorate of Fellingsbro in the diocese of Westerås in Sweden. He died at Fellingsbro, April 25, 1800. After his return to his native land he wrote the work that has given him a prominent place among the early writers on colonial history, *Beskrifning | Om De | Swenska | Församlingars | Forna och Närwarande | Tilstånd, | Uti | Det så kallade Nya Swerige, | Sedan | Nya Nederland, | Men nu för tiden | Pensylvanien, samt näst-liggande Orter wid Älf-wen De la Ware, Wäst-Yersey och New- | Castle County uti Norra America.* (*Description of the Former and Present Condition of the Swedish Churches in what was called New Sweden, afterwards New Netherland, but at the Present Time Pennsylvania*, Stockholm, 1759.) The book does not confine itself, as might be inferred from its title, to ecclesiastical matters, but contains interesting chapters on the political history and social state of Pennsylvania and New Jersey, and is considered a valuable source of authentic information. A portion of it was translated into English by Rev. Dr. Collin, the last Swedish rector of the churches on the Delaware, and was printed in the *Collections* of the New York Historical Society in 1841. The desire for an English translation of the whole work was at last gratified in 1874. The translation, made by Rev. Wm. M. Reynolds, was published under the joint auspices of the historical societies of Pennsylvania and Delaware, and forms the eleventh volume of the *Memoirs of the Historical Society of Pennsylvania*.

ACROMYODI (Gr. ἄκρος, pointed; μῦς, muscle), in ornithology, one of the primary divisions of the great order Passeres; equivalent to *Oscines*, or singing birds. The acromyodian birds are so named from the insertion of the intrinsic muscles of the voice-organ (lower larynx or *syrinx*) into the extremities of the upper bronchial half-rings. The construction results in a rocking or rotating movement of the syringeal pieces, and consequent infinite degrees of tension and modes of vibration of the vocal membranes, perfecting a musical instrument which gives forth the endlessly varied songs of birds. Opposed to *Mesomyodi*, or *Clamatores*, which have a much simpler and less effective vocal organ, with the muscle or muscles inserted into the middle of the upper bronchial half-rings. (E. C.)

ACTA MARTYRUM ET SANCTORUM. These are, literally, the record of the lives of the martyrs and other saints. The Catholic Church was careful from the earliest times to gather details of the last days of those who gave their lives to bear witness in their blood to the faith which they professed. St. Clement, a disciple of St. Peter, is said to have instituted a body of notaries in Rome, whose duty it was to commit to writing and preserve these interesting memorials. Their collections formed an important part of the ancient archives of the Roman Church. St. Anterus, who became pope in A. D. 238, was particularly zealous on this point, and it was in supervising the discharge of this pious office by his clerics that he was himself put to death. The example of the Roman Church was followed throughout the Christian world. On account of the vehemence of the persecutions and of other circumstances, sometimes only the names and bare dates, sometimes only a few meagre indications, could be given; but in more favorable cases full biographical notices were recorded. It soon became a matter of difficulty and danger to gather the acts of the martyrs, and recourse was often had to bribes to the officials of the courts of justice and to executioners in order to evade it. The pagans perceived as early as the reign of Domitian that the Christians set great value on authentic relations of the trials and persecutions of their brethren, and therefore they made these acts an object of minute research, so that many copies were destroyed either by their captors, or by their possessors to hinder them from falling into the hands of the heathen. But a small part of the acts of the martyrs has outlived the persecutions of the Roman empire, the invasion of the barbarians, and the neglect of literature during the Middle Ages.

Eusebius, bishop of Cæsarea in the fourth century, was the first writer to undertake a complete collection of these acts in all the different churches; but his work was already lost by the sixth century, although a special treatise composed by him on the martyrs of Palestine has been preserved. Towards the end of the seventeenth century a learned Benedictine, Dom Ruinart, made the most perfect collection then possible of these early but long-neglected documents. He used only original manuscripts, which, moreover, he subjected to a rigid criticism, so as to justify the title which he gave to his work of *genuine* acts of the martyrs—*Acta Sanctorum Martyrum Sincera*. It was published at Paris in 1689. Ruinart limited his researches to the acts of the early martyrs, but the Jesuit Rosweyd had long before conceived the design of publishing the lives of all the saints of the Roman calendar. He died before he could do more than announce his project to the learned world, which he did in an erudite Latin work published at Antwerp in 1607. Two of his literary disciples, Jesuits like himself, Fathers Bollandus and Henschen, commencing with the materials which he had collected, and industriously adding thereto, were able to begin the grand undertaking which he had planned by publishing in 1643 the first two volumes of that colossal work which has since been called, as superseding everything else on the subject, the *Acta Sanctorum*. The work has been continued by successive writers of the order of Jesuits, with a long intermission occasioned by the suppression of the Society in the last century, down to our own day, and is still far from finished, although more than seventy folio volumes have been published. The writers who have been engaged on the work are called *Bollandists*, from Father Bollandus. (R. S.)

ACTION. In many of the United States the old forms of action as they existed in England prior to the Judicature Act of 1873 have been retained, and this is also the case in the United States courts. In many States, however, the distinction between the various forms of action has been abolished, and, as in England, but one form of civil action for the enforcement or protection of private rights or the redress of private wrongs is recognized. Such is now the law in New York, Ohio, Missouri, Indiana, California, Kansas, Nebraska, Utah, Louisiana, Wisconsin, Minnesota, Colorado, Nevada, and South Carolina. But although, in these States, all actions are now brought in the same form, yet there are many intrinsic differences in actions which no law can abolish. Mere formal differences have been annihilated; the substantial differences remain as before. The same proof, for example, is required in each particular kind of action as before the abolition of the formal differences, in order to entitle the plaintiff to the relief which he seeks. The principles, therefore, by which the former actions were governed may be still said to remain, and to control as much now as formerly in determining the rights of the parties. (L. L., JR.)

See Vol. I. p. 122 Am. ed. (p. 132 Edin. ed.).

ACT OF GOD, or ACTUS DEI, in law, any accident due to natural causes directly and exclusively without human intervention, such as could not have been prevented by any amount of foresight and pains and care reasonably to be expected. Lord Mansfield said the act of God means something in opposition to the act of man. The term includes therefore an earthquake or tempest, a severe snowstorm which impedes travel, the freezing of a river, a frost of extraordinary severity, an unprecedented flood or freshet, a sudden gust of wind or a sudden failure of it. On the other hand, an ordinary fire is not considered as the act of God, while a fire driven by a tornado or caused by lightning is. Nor does the term include the shifting of a buoy by some supposed natural cause, or the freezing of perishable articles which might have been prevented by due care, or theft by an employé or other person. The legal maxims applicable are *Actus Dei nemini facit injuriam* (the act of God is so treated by the law as to affect no one injuriously), and the similar one, *Lex non cogit ad impossibilia* (the law does not compel a man to do that which he cannot possibly perform). Where the law creates a duty or charge, and the party is disabled to perform it without any default of his own, and has no remedy over, the law will in general excuse him. Common carriers, in accordance with this principle, are not liable for loss arising from the act of God or the king's enemies. The Roman law made no distinction between the act of God and inevitable accident arising from other causes, but gave immunity wherever the loss resulted from *casus fortuitus* or *damnum fatale* or *vis major*, which are synonymous terms; and in like manner by the Scotch law not only storms and pirates, but also housebreaking and fire, constitute *damnum fatale* which will exonerate the innkeeper or carrier. The theory of the common law, on the contrary, regarded the liability of the carrier as dependent upon his remedy. As bailee and possessor he had a remedy at law against the violence or negligence of others, but as he could have no redress against the acts of God or the public enemy, he was not liable over to his bailor.

Sir William Jones has endeavored to substitute for "act of God," as more proper and more reverent, the term "inevitable or unavoidable accident." In accordance with his opinion, this term and "the act of nature" are frequently but improperly used as equivalent to the act of God. (J. M. G.)

ACTON, SIR JOHN EMERICH EDWARD DALBERG, LORD, was born at Naples, Jan. 10, 1834, and succeeded to the baronetcy when about three years of age.

He studied for several years in the Catholic college of St. Mary's, Oscott, but from 1850 to 1854 he was at the University of Munich, under the tuition of Dr. Döllinger. After leaving college he made the tour of the United States in company with his stepfather, Lord Granville. From 1859 to 1865 he was in the House of Commons as member for Carlow, Ireland. In 1865 he became the candidate of the Liberal Catholics for the borough of Bridgenorth, but was defeated. In the same year he married the daughter of Count Arco-Valley of Munich. In 1869, under Mr. Gladstone's recommendation, he was made a peer with the title of Baron Acton of Aldenham. In 1869 he repaired to Rome on the assembling of the Œcumenical Council, where he became conspicuous by his active hostility to the doctrine of papal infallibility. He may be regarded as the leader of the Liberal Catholics, in advocacy of whose doctrines he founded in 1861 the *Home and Foreign Review;* this ceased to be issued in 1864. He afterwards edited the *Chronicle*, a weekly newspaper, which soon failed from lack of support. At a later date he purchased and edited the *North British Review*, which came to an end under his management. In 1863 he edited *Matinées royales*, a work which has been attributed to Frederick the Great, but which has excited much controversy in Germany. In 1870 he took an active part in the Old-Catholic movement, and wrote in its support *Zur Geschichte des vaticanischen Concils* (Munich, 1871). He is said to have assisted Prof. Huber in the preparation of the famous book *Janus, or the Pope and the Council*, and also to have written the famous "Letters from the Council" which appeared in the *Allgemeine Zeitung* of Augsburg. His *Letter to a German Bishop present at the Vatican Council* (in German, Nördlingen, 1870) elicited from Bishop Ketteler of Mayence a spirited reply, which has been translated into English. He published in 1871 a pamphlet upon the *War of 1870*, and in 1874 actively engaged in the controversy which arose on the publication of Mr. Gladstone's pamphlet concerning the civil influence of the decrees of the Vatican. (C. M.)

ADA, an incorporated village of Hardin co., Ohio, is on the Pittsburg, Fort Wayne, and Chicago Railroad, 57 miles west of Crestline. It has a fine city-hall, two banks, a weekly newspaper, a steam fire-engine, seven churches, and a graded public school. The Northwestern Ohio Normal School, founded here in 1871 by Prof. H. S. Lehr, is attended annually by 2000 students. The village was laid out in 1853 under the name of Johnstown, but was incorporated in 1871 by its present name. Population, 1760.

ADAIR, JAMES, an English trader with the American Indians, resided among them from 1735 till the outbreak of the Revolution. His chief connection was with the Chickasaws in Georgia, with whom he first traded in 1744. He published at London in 1775 a *History of the American Indians, particularly those Nations adjoining the Mississippi.* He argued that they were descendants of the Lost Tribes of Israel, alleging many proofs from their customs.

ADAMS, CHARLES FRANCIS, son of John Quincy Adams and grandson of John Adams, was born in Boston, Mass., Aug. 18, 1807. At the time of his birth, his father was a member of the U. S. Senate, and his illustrious grandfather was living in retirement and in full possession of his mental faculties, having then before him nineteen years of a very long and useful life. When Charles Francis Adams was two years old, he was taken to St. Petersburg by his father, Mr. J. Q. Adams, who had been appointed minister at the Russian court by Pres. Madison. The lad, as soon as he reached an age at which his precocious desire for acquiring knowledge could be safely gratified, was placed under the charge of competent tutors, and he soon developed an unusual aptitude for study. He mastered the French, German, and Russian languages. His education was subsequently further advanced by his being put to school in Ealing, a suburb of London, his father having been appointed U. S. minister at the court of St. James. After a long residence in foreign lands, Mr. Adams returned to his native country in 1817, and entered the Boston Latin School. In due time he was admitted to Harvard College, from which institution he was graduated in 1825, the year of his father's election to the Presidency of the United States.

Mr. Adams accompanied his father to Washington, where he studied law under his direction. In the national capital he enjoyed and profited by rare opportunities for the observation of public men and the study of American and foreign politics. After one year's study in the law-office of Daniel Webster, then practising in the city of Boston, Mr. Adams was admitted to the bar in 1828. He never practised, however, but devoted himself to study—international law, jurisprudence, history, finance, and other large themes engaging his attention. He took no active part in politics, but wrote much for the press, the then powerful *North American Review* being one of his channels of communication with the public. At the age of twenty-two years he married the daughter of Peter Chardon Brooks, then the wealthiest citizen of Boston. His active mind engaged him in the discussion of many of the public questions of the time, financial and economical problems being among those which occupied his powers, now beginning to develop remarkable strength. In 1841, when he was thirty-four years old, Mr. Adams was chosen representative to the General Court, as the Massachusetts legislature was called. He was elected as a Whig, and served three consecutive terms, when he was transferred to the senate of the State. It was during this portion of his career that he began to manifest that independence and firmness of character which so distinguished him in later years. It may be said of Mr. Adams that he inherited all of the peculiar traits of the remarkable family of which he was a member. The Adamses led rather than followed. They were cold, unsympathetic, dignified, unbending, self-poised, uncompromising in adherence to right, and immovable as granite whenever once assured of the wisdom and righteousness of a position. These qualities early appeared in Charles Francis Adams: they made him a marked character in American politics in after years. Although elected by the Whig party, then inclined, in Massachusetts, to regard with toleration the aggressive temper of Slavery, Mr. Adams early took ground against the spirit of compromise. The Whig party was divided into two sections, known as "the Cotton Whigs" and "the Conscience Whigs." Mr. Adams attached himself to the latter wing of his party. He lent to the cause of anti-slavery the influence of a lofty social station, large wealth, the honor of a great name, and talents of a high order. Although never affiliating himself with what was known as the Abolition or Anti-slavery party, it was impossible that his commanding position in affairs should not be of great value to the struggling cause. While he was in the legislature, he wrote the protest issued by that body against the expulsion of Mr. Samuel Hoar, who had been sent from Massachusetts to South Carolina to defend certain colored persons, residents of Massachusetts, seized and imprisoned under the local laws.

Very soon after the election to the Presidency of James K. Polk, in 1846, a prevailing discontent with the policy of the two great political parties of the country began to appear, and the more advanced liberals of Massachusetts, after seeking for some mode of promulgating their political sentiments, purchased a newspaper, of which Mr. Adams became the editor. He was now the acknowledged leader of the Free-Soil party, just coming into existence. With him were associated Charles Sumner, Henry Wilson, John G. Palfrey, and many other men who were afterwards famous in the struggle that terminated in the Civil War. In 1848 he presided over the Free-Soil convention, a notable and historic convocation, that assembled in Buffalo, N. Y. This convention nominated Martin Van Buren for President and Charles Francis Adams for Vice-President. Seventeen States were represented by delegates, and the party subsequently threw 300,000 votes, the Whig candidate, Gen. Zachary Taylor, being elected by a large majority.

Kept in a minority by New England conservatism, Mr. Adams remained in private life, although devoting himself, by various means, to the dissemination of those ideas of human rights and political responsibility which he thought most needful for the enlightenment of his fellow-citizens. In 1858 he was elected to Congress for the first time, from the third district of Massachusetts. He made few speeches in Congress, but a speech which he delivered during the second year of his term attracted marked attention on account of its purpose and ability. It was a defence of the Republican party, and its cogency of statement, logical directness, and masterly exposition of the principles and purposes of the Republicans made it a remarkable contribution to the controversy then agitating the republic.

During the Congressional recess of 1860, Mr. Adams accompanied Mr. Seward on his Western tour, and frequently spoke in defence of the principles and policy of the Republican party. In Jan., 1861, he supported the compromise measures of "the committee of thirty-three," of which he was a member. These measures were based on a proposed constitutional amendment forbidding interference with slavery in the States in which it already existed, and the admission of New Mexico as a State, with or without slavery as the people might elect. Devices like these proved ineffectual to stay the rising tide. War soon began, and the conflict which Mr. Adams had seen was inevitable was now precipitated upon the republic. His appointment as U. S. minister to the court of St. James was among the very first determined upon by the Lincoln Administration, which came into power. Mr. Adams reached England immediately after the issuing of the queen's proclamation of neutrality, and at a time when the controlling influences of English politics and society were unmistakably manifested in favor of the new Confederacy of the South. The Confederates had been recognized as belligerents, and there were very few Englishmen in public life who did not expect and believe in the ultimate triumph of the Confederate cause. The British authorities were apparently unable to enforce their own neutrality laws, and they depended upon the American minister, aided by the American consul at Liverpool, Mr. Dudley, to procure evidence needed to secure governmental interference with the numerous enterprises against the United States that were planned in British dominions. For this task Mr. Adams was admirably fitted. With unremitting patience and unyielding firmness he applied a steady pressure to the British Government day after day and for several years. He addressed to unwilling ears his convincing protests and unanswerable reasoning. Never dismayed or disturbed by the almost contemptuous indifference of those to whom he directed his complaints, and with absolute confidence in the justice of his cause, he maintained his ground without flinching and without bravado. With rare wisdom and tact he won his way in society, making friends where his country had none. When, in 1868, after a residence of seven years in England, Mr. Adams returned to his native land, he received the unusual tribute of a letter testifying to the esteem with which he was regarded by the signers, among whom were the men most eminent in the British nation, members of the Government and of both the great political parties.

The crowning honor of Mr. Adams's life, as well as his most notable opportunity to prove his great abilities, was his appointment as arbitrator at the Geneva tribunal of arbitration on the Alabama claims. His learning and impartiality were now brought into requisition so forcibly that he won the cordial and emphatic acknowledgments of the Government with whose representatives he had so long contended. His preeminent skill was recognized by the publicists of the world, the proceedings of the tribunal having attracted universal attention. Mr. Adams's satisfaction with the result of the arbitration removed any feeling of disappointment which his fellow-countrymen may have felt.

Returning home, he retired once more to private life, but kept himself thoroughly informed of public affairs. In 1872, when the "Liberal" movement began, he entered into it with his usual earnestness, and was pressed for the presidential nomination by some of his zealous friends. Mr. Horace Greeley was nominated, and the absorption of the new party by the Democrats served to alienate from the organization many sincere men, among whom was Mr. Adams. In 1876 he was nominated for governor of Massachusetts by the Democrats, but he took no active part in the campaign, and he accepted his defeat with indifference.

Mr. Adams's contributions to the literature of his country are voluminous. He edited and published *The Works of John Adams*, in 9 vols., the opening volume of the series containing "A Life of John Adams, by his Grandson, Charles Francis Adams." He also edited the letters of Mrs. John Adams, and of John Adams to his wife. The *Diary of John Quincy Adams*, in 12 vols. 4to, is another of the historical works with which his name, as editor, is connected. (N. B.)

ADAMS, CHARLES FRANCIS, JR., second son of the preceding, was born at Boston, May 27, 1835. After graduating at Harvard College in 1856, he studied law, and was admitted to the bar in 1858. On the outbreak of the Civil War he entered the Union service as lieutenant in the First Massachusetts cavalry. After more than two years of service in this regiment he became lieutenant-colonel of the Fifth Massachusetts cavalry, a negro regiment. He was afterwards promoted to the coloneley, and on the capture of Richmond entered it at the head of his troops. He has since devoted much attention to social and economic questions, and especially the railroad system of the United States. He first published the results of his investigations in articles in the *North American Review*. In 1869 he was appointed by the governor of Massachusetts a member of the State board of railroad commissioners. Several of his articles on railroad management, together with some by his brother, Prof. Henry B. Adams, were revised and published under the title *Chapters of Erie* (1871). His later volume on *Railroads, their Origin and Problems* (1879), is a condensation of the more important parts of numerous articles and of his reports as commissioner. When his term of office expired in 1879, he declined a reappointment. An organization was then formed by the principal railroad companies, whose roads lay north of the Potomac and the Ohio and west of the Mississippi, and this joint executive committee selected Mr. Adams, together with Messrs. D. A. Wells and J. S. Wright, as a permanent board of arbitrators to settle disputes arising among the companies. In 1882, Mr. Adams was selected as sole arbitrator.

ADAMS, NEHEMIAH, D.D. (1806–1878), an American Congregational minister and author, was born at Salem, Mass., Feb. 19, 1806. While he was a child, his father, Nehemiah Adams, Sr., a cabinetmaker, lost all his property, and the son while acquiring an education was obliged to work for his living. While a student at Harvard College he taught school at North Beverly in the winter. Having graduated in 1826, he studied theology at Andover, and on Dec. 17, 1829, was ordained colleague with the venerable Rev. Dr. Abiel Holmes, pastor of the First Congregational Church, Cambridge, Mass. In 1831, Dr. Holmes having resigned his charge, Mr. Adams became sole pastor, but in 1834 he removed to Boston, where he was installed pastor of the Union Congregational Church on Essex Street. In the early part of his ministerial career he engaged in the controversy with the Unitarians, and was a frequent contributor to the *Spirit of the Pilgrims.* He was always an earnest, eloquent preacher, a tender-hearted pastor, devoted to his congregation and beloved by them. Several of his publications grew out of his pastoral experience. In 1853, on account of his wife's failing health, he accompanied her to Georgia, and spent three months on the plantation of a wealthy slave-holder. As the agitation produced by the publication of *Uncle Tom's Cabin* was then at its height, Dr. Adams carefully examined Southern slavery as he found it, and on his return to Boston gave his views in a volume called *A South-side View of Slavery.* He maintained that with proper regulations the institution was beneficial to both master and slave. He also had a public correspondence with Gov. Wise of Virginia on the same subject, and in 1861 published *The Sable Cloud, a Southern Tale with Northern Comments.* In 1869, having had an attack of apoplexy, he obtained leave of absence from his congregation, and sailed from Boston Oct. 4, in the ship Golden Flame, commanded by his youngest son. His voyage extended around the world, and an account of it was published in a volume called *Under the Mizzen-mast.* Returning May 16, 1871, he was unable to resume his former work, and was made pastor emeritus, Rev. H. M. Parsons being active pastor. After a gradual decline, Dr. Adams died at Boston, Oct. 6, 1878. His publications were generally of a devotional character; besides those already mentioned the principal were—*The Baptized Child* (1834), *Remarks on the Unitarian Belief* (1832), *Life of John Eliot* (1847), *The Friends of Christ in the New Testament* (1855), *Christ a Friend* (1855), *Communion Sabbath* (1856), *Bertha and her Baptism* (1857), *Catherine* (1859), *The Great Concern* (1860), *Evenings with the Doctrines* (1861), *Broadcast* (1863), *Agnes and the Little Key* (1863), *The Cross in the Cell* (1866), *Walks to Emmaus* (1879). At the request of several ministers he published in 1877 a selection from his later sermons under the title *At Eventide*, and in 1882 a second edition of this volume was issued, with a brief biographical sketch by his son. R. C. Adams.

ADAMS, William, D. D. (1807–1880), an eloquent Presbyterian minister, was born at Colchester, Conn., Jan. 25, 1807. He was taught by his father, John Adams, LL.D., in Phillips Academy, Andover, and graduated at Yale College in 1827. He studied theology at Andover, and in 1831 was ordained as pastor of a Congregational church at Brighton, Mass. In 1834 he was called to New York as pastor of the Central Presbyterian Church, which in 1853 was removed to another site and became known as the Madison Square Presbyterian Church. When his denomination was divided in 1838, he adhered to the New School branch, and soon became prominent in it, as well as in the various undenominational societies, religious and benevolent, which had their head-quarters at New York. In 1852 he was moderator of the General Assembly, and afterwards took an active part in the reunion of the Presbyterian Church, which was accomplished in 1870. In 1873 his son-in-law, Mr. J. C. Brown, offered to endow the Union Theological Seminary with $100,000, on condition that Dr. Adams should take the presidency of that institution. Although reluctant to part with the congregation to which he had ministered for thirty-nine years, he felt it his duty to accept the position, which he held till his death. He was a delegate to the First Presbyterian Council, which met at Edinburgh in September, 1876, and was appointed to preach the opening sermon at its next session in Philadelphia in September, 1880, but had scarcely begun to write the sermon when he died, August 31, 1880, at Orange Mountain, N. J. His principal books are *The Three Gardens: Eden, Gethsemane, and Paradise,* 1859; *Conversations of Jesus Christ with Representative Men,* 1868; *Thanksgiving, Memories of the Day and Helps to the Habit;* he also published many sermons and orations and contributed articles to several religious reviews. In a course of lectures on the Catacombs of Rome he made important corrections in the current translation of several inscriptions.

ADEMPTION, in law, the extinction or withdrawal of a legacy in consequence of some act of the testator which, though not directly a revocation of the bequest, is considered in law as equivalent thereto. A legacy of any specific chattel will be adeemed by the testator's selling or otherwise disposing of it in his lifetime, or by a conversion of it at his order or request into such a form as will alter the specification of it. So, too, a mere removal of chattels will sometimes operate to adeem a bequest of them. Thus, where a testator bequeathed all his books in a certain place, the removal of the books by his command elsewhere prior to his death was held to extinguish the legacy. Ademption by removal can only take place, however, where the removal is with the testator's knowledge and approval.

A specific legacy of a debt or security for money will be adeemed by the receipt of the amount due by the testator in his lifetime, no matter whether his acceptance of the same was compulsory or voluntary. So a partial receipt by the testator of a debt specifically bequeathed will operate as an ademption *pro tanto.*

Where stock is specifically bequeathed, and does not exist, either in whole or in part, at the time of the testator's death, the legacy will be considered to be totally or partially adeemed, as the case may be, unless, indeed, the stock has been exchanged or converted by operation of law, in which case no such result follows. Such a legacy is irretrievably adeemed by the sale of the stock, and will not be revived by a new purchase of similar stock by the testator.

General and demonstrative legacies are usually not subject to ademption. They may, however, be thus extinguished in certain cases. Where a parent, or one who stands *in loco parentis,* gives a legacy to a child, that will be deemed to constitute a portion, and if subsequently the testator makes an advancement of property to the child, either greater, equal to, or less in value than the legacy, said legacy will be considered adeemed in whole or in part accordingly. It will make no difference in the application of this rule that the property advanced is of a wholly different sort from that bequeathed or that it is settled with entirely different limitations. If, however, it can be clearly shown by evidence that the intention of the testator in making the advancement was not to adeem the prior legacy, that result will not follow. (L. L., JR.)

ADLERBETH, Gudmund Göran (1751–1818), a Swedish author, was born in 1751. He wrote some good tragedies and made excellent translations of Virgil, Horace, and Ovid. His greatest merit consists in his having called attention to old Norse poetry by his translation of Eving Skaldespiller's poem on King Hakon. His *Historical Notes,* published after his death, are a valuable contribution to the history of Sweden from 1771 to 1807.

ADLERCREUTZ, Carl Johan (1757–1815), a Swedish general, was born April 27, 1757, in Finland. He entered the military service in early youth, and distinguished himself in the war with Russia (1788–90). He was a colonel when the war of 1808 began, and soon afterwards became chief of the staff of the Finnish army. In the victory of Siikajoki he compelled the Russians advancing under Tutschkoff to halt, and in the battles of Lappo and Alavo against Rajewski he forced them to retreat still farther; but when the Russians under the command of Kamenski were reinforced, he was obliged to leave Finland after the bloody battle of Oravais. In Stockholm he joined the enemies of the imprudent policy of Gustaf IV., and it was he that took the king prisoner. Adlercreutz became lieutenant-general in 1809, cabinet officer in 1810, and general in 1811. He took part in the wars in Germany in 1813, and the invasion of Norway in 1814. He died Aug. 21, 1815.

ADLERSPARRE, Georg (1760–1835), a Swedish statesman and author, was born March 28, 1760, and entered the army in 1775. He took part in the war against Russia (1788–90), but resigned in 1794, and devoted many years to literature. He published several works on political economy, history, and military tactics, and a prominent periodical for that time, *Läsning i blandade ämnen* (1797–1801). In 1808 he again entered the army, and marched in 1809 against Stockholm, and thus caused the imprisonment of Gustaf IV. by Adlercreutz. He served the state in various high positions until 1824, when he resigned and edited his work in nine volumes, *Handlingar rörande Sveriges äldre och nyare historia.* His death occurred Sept. 23, 1835.

ADLERSPARRE, Karl August (1810–1862), eldest son of Georg Adlersparre, was born June 7, 1810. He gained his first popularity by a volume of poems, which were followed by other poems and novels, published under the *nom-de-plume* "Albano." His reputation, however, is chiefly based on his historical works—*1809 Ars Revolutionen och dess män* (2 vols., Stockholm, 1849); *1809 och 1810, Tidstaflor* (3 vols., Stockholm, 1850); and *Anteckningar om bortgångna Samtida* (3 vols., Stockholm, 1859–62). He died May 5, 1862.

ADMINISTRATOR, a person duly authorized by law to attend to the settlement of the estate of one who dies intestate, or of a testator of whose will there is no executor. In the latter case the administration is *cum testamento annexo*. By the Scottish law, "administrator" is the general term used as the title of any one acting for one incapacitated by law to act in person.

See Vol. I. p. 141 Am. ed. (p. 154 Edin. ed.).

Administrators were known to the civil law, but did not exist in England prior to the 31st year of Edward III. Prior to that time the duty of administering to the estates of decedents devolved upon the king, and was by him entrusted to the bishop or ordinary. Hence we find that the administration of intestates' estates became part of the jurisdiction of the ecclesiastical courts in England. The general theory of the law as to the distribution of the estates of intestates in this country is that, in the absence of any expressed intention on the part of the decedent, his estate should go in such channels as, in the exercise of natural love and affection, it would have been likely to be directed by will. In all the States of the Union there are laws regulating the disposition of intestates' estates, both as to real and personal property. (See Intestates, Intestacy, Inheritance.) Under the operation of these laws the real estate passes directly to specified heirs, and provision is made for the administration of the personal property, generally by the appointment of the nearest relation of the decedent as administrator. Thus, the husband has the administration of his wife's property, and the widow of that of her husband. After that the appointment is made in the order of kinship, computed in some States by the rule of the civil law, and in others by the English rule. In most States the order is—husband or wife, children, father or mother, brothers or sisters, grandchildren, uncles, aunts, nephews, nieces, etc. When two or more are in the same degree of kinship, the probate judge or surrogate decides between them. If there are no relatives, the creditors of the decedent have the right of administration.

The duties of an administrator are to collect all claims due to the estate, to pay all the debts of the decedent, and to distribute the balance remaining in his hands according to the order of the proper court having jurisdiction of his account. In the payment of debts he must first pay all those caused by the decedent's last illness and funeral expenses. In most of the States there are provisions giving priority also to debts due the United States and the State in which the decedent was domiciled at the time of his death. Beyond his responsibility to see to the proper administration of the estate according to the law, an administrator is not liable except for misconduct or gross negligence in managing the property entrusted to him. Such misconduct is known in the law as *devastavit*. In all the States of the Union an administrator properly discharging his duty is allowed a reasonable compensation for his services. (s. w.)

ADMISSION, in law, a concession or voluntary acknowledgment, made by a party, of the existence or truth of certain facts. The term is employed only in civil cases, the corresponding expression in criminal practice being "confession."

Admissions are sometimes made by deed under seal, and in such cases are conclusive as against parties making them.

Admissions not under seal are either judicial in their nature or not judicial. Judicial admissions are such as are solemnly made by a party to a cause either in the pleadings or subsequently. These are conclusive in their effect upon the rights of the party making them. Admissions other than judicial consist of such statements or conduct of a party in a suit as amount to a concession by him of the truth of certain facts. Admissions of this character, when proved, will be submitted to the jury as evidence, but are not conclusive as against the party making them unless, in consequence of their being made, the other party to the suit has been induced to act in some manner which has proved to be to his prejudice. Admissions made by some other person than a party to the suit are sometimes allowed in evidence against him. It is on this principle that the admissions of privies in estate, agents, etc. are received. The admissions of a mere stranger are not usually competent evidence.

The admission of one party to a suit is not receivable in evidence as against other parties on the same side, unless there be some joint interest or privity of design between them. A mere community of interest is not enough to warrant this result. Admissions made under circumstances of constraint or compulsion are receivable in evidence, provided that the compulsion was legal and the party was not imposed upon nor under duress.

Admissions not only consist of direct or incidental statements, but may also be implied in certain cases from unusual conduct or from silence. Much care must, however, be taken in regard to admissions inferred from silence, the weight of authority being that they never ought to be received at all unless there be evidence of some declaration made to the party with respect to his right which is of such a character as naturally to call for contradiction. (L. L., JR.)

ADOBE. The adobe, or sun-dried brick, is probably one of the oldest forms of materials used in the construction of buildings of all kinds. From the days of Nineveh to the present its use has been constant, and the limit of its area dependent only upon climatic influences. Under the term *adobe*, however, are generally included only the modern constructions in those parts of America inhabited by the descendants of Spanish colonists. The ruins of Assyria show the same form and the same mode of construction and protection; and the Spaniards found in America the same method in use by the native races of the dry or "rainless" areas of their colonization field. To ensure success in the use of partially indurated clay as a building material, it seems to be necessary that the rainfall shall be not over 20 inches, although occasional heavy storms or greater fall may be guarded against. It seems necessary also that there shall be no continued frost of long duration and no heavy fall of snow for long periods. The material from which the bricks are made must be principally clay, but must contain sand or pebbly gravel in such proportion that the shrinkage shall not be violent. Adobes are, however, made of any kind of clay or soil that will hold together, and when carefully used and well protected from the weather will stand almost as well as better material. Their use and the spread of their employment appear to have been purely empirical, and if found to fail other material was adopted, simply because the first tried did not succeed. There are reasons to believe that some of the constructions of the Mound-builders were of adobes, and that they were familiar with their use, and possibly tried to extend in all directions the areas of towns, such as now are found in Arizona and New Mexico, built entirely of adobe. It is certain that from the high, dry plateau system of the south-west portion of the United States, where it flourished at its best, the adobe construction radiated in every direction to the north and east until unfavorable conditions checked its spread. The ruins of Central America show in general that stone alone was suitable in that region. The advent of the Spaniards did not alter, and hardly improved, the system of architecture. Some of the important buildings erected were made more pretentious by the addition of a meretricious system of ornamentation, but they are not more secure or better built than those of the natives.

The making of adobes is simple in the extreme. The builder selects a flat place, as near his building as possible and convenient to water. He aims to secure a good fire-clay, but will take an inferior article. The material, stirred to a thick mud with sufficient water, is sometimes worked by a brick-mill and horse-power, but is more often stirred by a hoe. The moulds may be of any size, generally three inches thick, six or more wide, and fifteen to eighteen inches long. The bricks are dried in the sun with either side up by turns, and then on the edge, and the process is complete. A hard day's rain will sometimes spoil the unfinished bricks; a longer rain will certainly do it, and sometimes even wash down a half-built wall of dried adobes.

The mud from which these bricks are made is also used as mortar in laying them, and the walls are made three or four times as thick as would be necessary if burnt bricks were used. But when in place, and well plastered on the outside with a mud or lime plaster, and a dry roof over all, there is no limit to the life of an adobe house, provided the rain and snow are kept out of the walls. A flat roof, made by using logs or beams reaching from wall to wall, and then covering the cross-planking with a layer of dirt six or more inches deep, is generally associated with adobe houses. This is owing only to poverty, however, of timber or other good roofing-material, and such a roof, when water- or snow-laden, is an extra burden and danger to the house. Houses built with pitched roofs of tin or shingle, and with good eaves, well plastered on the outside and lime-washed, are durable, attractive in appearance, and very comfortable in winter or summer. Sometimes, when the adobe contains limestone in its composition, a half burning will make it a good hard brick, very suitable for fireplaces and chimneys, which otherwise are in constant need of repair.

Adobe houses are generally of one story and without a cellar; they are sometimes of two, but very rarely of more than two, stories in height. Churches and cathedrals are built much higher in walls and towers, but without exception look very bulky and uneven, and in general the walls cannot sustain the weight, but crack or settle, to the destruction of their appearance, if not danger of their existence.

Within the limits of rainfall and temperature to which this construction is adapted, adobe buildings, well built and with good roofs and well cared for, will probably always be used, but elsewhere they cannot be maintained.

(E. H. R.)

See Vol. I. p. 150 Am. ed. (p. 165 Edin. ed.).

ADRIAN, the county-seat of Lenawee co., Mich., is a flourishing city, 33 miles west of Lake Erie, on the main line of the Lake Shore and Michigan Southern Railroad and of the Detroit, Wabash, and St. Louis Railroad. There are also six branch roads connected with these and other railroads passing through or terminating in the city. It is on both sides of the river Raisin, which gives good drainage and furnishes abundant water-power for manufactories. It contains the Peninsular car-works, Lake Shore and Michigan Southern car-shops, wheelbarrow-works, the Adrian canning-works, straw-goods factory, pork-packing house, five flouring-mills, two steam granite-works, three furniture-factories, two machine-shops, three tinplate-works, large wagon-factories, and many other industrial establishments. Adrian is handsomely laid out with spacious, well-paved streets beautifully shaded with maples, so that it is called "Maple City." It contains Adrian College, under the control of the Methodist Protestant Church, and a handsome central public-school building, with branch schools in each of the four wards of the city. In the neighborhood, on a site of forty acres, is the State Reform School for girls, which cost $300,000. Adrian has a splendid Masonic temple, an opera-house, eleven churches, five large hotels, five banks, two daily and three weekly newspapers, an efficient fire department with three steam fire-engines and other appliances. It is lighted with gas, and while the water-supply is sufficient for the present, a system of water-works, costing $150,000, has been projected. With all these improvements the city debt does not exceed $25,000. Lenawee county was formerly heavily covered with timber, and there still remains a large growth of hard wood which gives employment to numerous saw-mills. Now, however, while it is shown by the Government reports to be the most productive agricultural county in the Union, it is especially noted for its dairy products, the revenue from which is greater than that from wheat. The population of Adrian in 1880 was 7849, but is now (1883) estimated at 10,000.

See Vol. I. p. 152 Am. ed. (p. 167 Edin. ed.).

ADULTERATION. The prevalence of adulteration in articles of every-day use in any country is generally in direct proportion to its civilization and the density of its population. In a new country the tastes of the community are of necessity simple, and the food-supply, though it may be coarse, is generally abundant. It is only when the population begins to be crowded that the trade of adulteration flourishes. A farming community which raises the most of the food it consumes, and grows the material from which its clothing is made, has little to fear from the arts of the adulterator. It is only when the middleman steps in between the producer and the consumer, or rather only when the producer and consumer cease to be identical, that adulteration begins, and we may set it down as an axiom that the more hands an article has to pass through between the producer and the consumer the more liable is it to become adulterated.

The wealthier classes in a community rarely suffer from adulteration; it is the lower and middle classes, who wish to enjoy the appearance at least of having the same luxuries as the wealthier, that are the most common victims of the fraudulent art.

In America the sources of food have been so abundant, and the food itself of such excellent quality and so low in price, that until recently but little fraud was practised, and that was generally of the most primitive kind, and was usually of the nature of short weight or measure, or inferior quality, rather than direct adulteration.

During the War of the Rebellion, however, the whole food-supply of the country was disarranged and adulterations of all kinds flourished. Foreign trade was to a great extent cut off, while the demand for foreign goods continued. Take, for example, the article coffee: the Government became a large purchaser; the price advanced both on this account and because it had to be paid for in gold; the market became flooded with various substitutes for coffee, chief among which were roasted peas and roasted rye, articles resembling coffee in but the one particular that they furnish with hot water a decoction of a dark color and a slightly bitter taste.

Until recently no systematic attempt was made to ascertain to what extent adulterated articles enter into daily use in this country. A number of spasmodic efforts have been made from time to time, either by individuals or by boards of health, to investigate the subject, but many of these have come to naught, and with the single exception of milk no article has been thoroughly studied. Many of these so-called investigations, indeed, have led to entirely erroneous results, either from the ignorance or the carelessness of the investigator.

While there have been no investigations worthy of the name, yet periodically some one has become interested in some branch of the subject, has collected all the newspaper notices that could be found, and on this basis, without taking the trouble to inquire into the truth of the reports, has succeeded in getting laws passed which in most cases are either impracticable or else are without means provided for their execution.

Nearly every State has more or less legislation upon the subject of adulteration, but in almost every case the law exists only on paper, since no attempt is made to enforce it. Many, if not all, of the larger cities in the United States have police regulations in regard to the sale of unwholesome articles of food, but, except in the case of milk, these regulations do not apply to adulterated articles.

As a result of the passage of the English Adulteration-of-Food Act a new agitation of the matter took place in this country, which resulted in a prize being offered by the *Sanitary Engineer* of New York for the best essay upon the whole subject of adulteration of food and drugs; a committee was appointed by the journal to examine these essays and to draft a law in accordance with the suggestions contained in them. The prize was awarded to G. W. Wigner, and the committee drafted a law which has been adopted, in substantially the form reported, by the States of New York and New Jersey, and in a modified form by the State of Massachusetts. It is too early yet to say how these laws will work in practice, for while they are to some extent founded upon the British law, they vary from it in important particulars, owing to the different forms of government in the two countries.

The adulterations found in the few investigations that have been undertaken have generally been of the same character as those found in England: in a few cases the business of substituting one article for another has risen to the importance of a regular trade. The oleomargarine- and the glucose-factories are illustrations in point. Both of these industries have risen to large proportions during the last ten years, and much needless alarm has been created by their operations. The opponents of each have gone so far as to ask Congress to adopt legislation practically prohibitory in its character.

Milk.—This has long been a favorite article upon which to practise the art of adulteration, and this art begins its operations before the milk is drawn from the cow. The whole aim of the farmer who raises milk for sale is to obtain as much as possible from the cow, without regard to its richness in cream, so that a cow which gives a large yield of poor milk is very often spoken of as "a milkman's cow." Pure, unadulterated cow's milk varies considerably in composition, being influenced not only by the food of the animal, but also by the breed, the length of time she has been milking, and various other circumstances. The following extremes were found in analyzing the milk of seventy cows from the vicinity of Boston; the milk in each case was vouched for as pure, having been brought directly from the cows to the laboratory by trustworthy persons:

	I.	II.
Specific gravity	1·032	1·026
Cream (vol. per cent.)	12·	10·
Sugar	4·63	3·86
Caseine and albumen	4·94	3·31
Ash	·74	·60
Solids not fat	10·31	7·77
Fat	5·95	3·07
Total solids	16·26	10·84
Water	83·74	89·16
	100·00	100·00

The first sample was the milk of a single cow; the last that of a herd. In Massachusetts and some of the other New England States an analysis of the suspected milk is necessary in order to secure conviction, for adulteration, in the courts. In New York and New Jersey the specific gravity and general appearance of the milk are considered sufficient, the officers in those States taking the ground that pure milk from a healthy cow never falls below 1·029 in specific gravity, unless there is an excess of cream present, and they rely altogether upon the judgment of the officer as to the fact of such excess.

In New York a strong effort has been made to stop the sale of skimmed milk, even when it is sold for what it is, the officers asserting that if the sale of skimmed milk is allowed it will be impossible to stop the sale of watered milk. They ignore the facts of the case in their discussion of it. It is just as easy to distinguish between skimmed and watered milk as it is to distinguish between whole and watered milk. Pure skimmed milk differs from whole milk in two respects: first, it has less fat, this being a necessary result of the removal of the cream; secondly, it has a higher specific gravity; the cream being the lightest constituent of the milk, of course its removal increases the density of the remainder.

The difference may be readily seen by comparison of the following analyses; the first is that of a sample of pure milk; the second, of the same milk watered; the third, of the same milk skimmed:

	I.	II.	III.
Specific gravity	1·030	1·024	1·034
Cream	9·	7·5	0·
Sugar	4·40	3·66	4·40
Caseine, etc	4·30	3·59	4·30
Ash	·60	·50	·60
Solids not fat	9·30	7·75	9·30
Fat	3·20	2·66	·30
Total solids	12·50	10·41	9·60
Water	87·50	89·59	90·40
	100·00	100·00	100·00

Milk is rarely skimmed as closely as that in the third example, which was skimmed by the centrifugal machine within a short time after it was drawn from the cow. This skimmed milk finds a ready sale in cities at two-thirds the price of whole milk. Watering and skimming appear to be the main frauds practised in the milk business, the latter being a fraud only when the skimmed milk is sold as whole milk. A common practice among milkmen is topping the cans; that is, allowing the cans to stand for some hours, and then pouring off the cream that has risen to the top, and filling the cans either from cans which have been similarly topped or with water. Occasionally in summer a little bicarbonate of soda is used to prevent the curdling of the milk. Boracic acid has also been used for the same purpose.

Butter and Cheese.—Until very recently the butter and cheese sold in this country were free from adulteration, although often of very poor quality; occasionally a sample was found which contained starch, and many of the makers were not above allowing all the buttermilk and water possible to remain in their product. Fats other than those produced from cream may for a long time have been used to mix with butter, but the business of openly producing a substitute for butter was first begun by A. Paraf in 1873. In that year he obtained a U. S. patent for the production of an artificial butter, and organized a company for its manufacture. The company soon found that this patent was worthless unless they held the rights belonging to M. Mége of Paris, France. They accordingly procured an assignment from him and had the patent issued in this country. This patent has been used since its issue as a weapon with which to annoy their competitors, but neither they nor their opponents have ever used it for any other purpose, and very little if any artificial butter has ever been made by strictly following the original patent. In order to cover as much ground as possible, it has been reissued twice, in each reissue matter being changed which M. Mége in his English and French patents declares is essential to the perfecting of the product. M. Mége seems to have had two ideas in view: the first of these was the production of a pure odorless fat which could be used for food purposes, and the second was the conversion of this fat into a substance resembling butter. As a pharmacist he was of course familiar with the method used by the trade to procure a fat pure and free from odor, the essentials being that the fat be perfectly clean and fresh, and that it be not burnt in the rendering. He endeavored to improve on the ordinary method of rendering by digesting or dissolving out the membrane by means of an artificial gastric juice made from the stomach of a hog or sheep with acid phosphate of lime, hoping in this manner to be able to render at a temperature as low as animal heat. Attempts to follow the patent in this respect have invariably resulted in failure. Experience has shown that good results cannot be obtained at a temperature much below 116° Fahr., even with the use of the gastric juice, and that in practice it is better to dispense with the juice and to render at a temperature considerably above 125°, which is the maximum laid down in the last reissue. The next operation proposed by Mége was lowering the melting-point of the fat until it corresponded with that of butter; this he accomplished by allowing the fats to crystallize, and then subjecting them to pressure; in this way he removed the excess of stearine contained in the fat. This process was not new with him, it having long been in use for the production of tallow oil and stearine.

In 1848, William Palmer took out an English patent, in which he proposed to utilize the softer parts of tallow as a substitute for lard or butter in cooking; in this patent he very fully describes the method used to obtain a pure fat. This process, with the single exception of the temperature employed, is substantially the one now used in the artificial-butter factories in this country. Both Mége and Palmer suggest that the tallow oil obtained by their respective processes may be used in a pure state as a substitute for butter or lard in cooking, and when so used there is no doubt of its being an excellent substitute; it has been sold to a small extent in this country under the trade name of "oxine," and deserves to be far more widely known. Mége goes a step farther and converts the tallow oil into a substance resembling butter. This he does as follows: "This fatty body, then, is taken and mixed (at animal heat) with its own weight of water, to which have been added $\frac{1}{50}$th of mammary tissues, $\frac{1}{100}$th of bicarbonate of soda, $\frac{1}{50}$th of fresh milk caseum, and a sufficient quantity of yellow color. The whole is digested for at least three hours, stirring during that time and keeping up the animal heat. When the transformation is complete the mixture is left to cool." Such was the original Mége process. The manufacture of the so-called oleomargarine, as now carried on in the best factories in the United States, is substantially as follows: The fresh suet, as soon as it is received from the slaughter-houses, is thrown into cold water—in summer ice is frequently used. This is done for two purposes: first, to remove the animal heat as quickly as possible; secondly, to get rid of the blood and dirt, of which there is always more or less adhering to the fat; the fat is then carefully sorted over and any bloody pieces that may be present are removed. It is absolutely necessary, in order to make a good product, that the fat be fresh and sweet; if it be tainted in the slightest degree it is impossible to make a good butter from it. After sorting, the fat is passed through cutting-machines similar to those used in the manufacture of sausage; this preliminary grinding serves to break up the tissues and render the next operation much easier. The hashed fat falls from the cutting-machine directly into rendering-kettles, where it is heated to a temperature of from 125° to 212° Fahr., according to the fancy of the manufacturer. The operation succeeds best and is most economical at a temperature of from 140° to 160° Fahr. The rendering-kettles employed may be heated by direct steam blown into the fat or by water- or steam-jackets. The water-jackets seem to be preferred, as they give a more even temperature and produce a somewhat better product than when steam is blown directly into the fat. As soon as the fat is completely melted it is allowed to settle, some common salt or strong brine being generally added to promote the separation of the scrap. Sometimes a little soda-ash is added for the same purpose. The clear oil is drawn off into coolers, where it stands until it has cooled to a temperature of about 100° Fahr. It is then transferred to the press-cloths, about two pounds being placed in each cloth; these press-cloths are simply pieces of sheeting about eighteen inches square. The semi-fluid mass is placed in the centre of the cloth, and the four edges are then folded over it, so as completely to enclose it; many hundreds of such packages are placed in a suitable press, being separated from each other by iron plates. The press is maintained at a temperature of from 95° to 100° Fahr. The oil is run from the press directly into barrels, in which it is kept until it is wanted for use. Some of the largest factories in this country do not attempt to make butter, but ship their entire product to Holland in this shape.

If it is desired to make butter, a certain portion of the oil is melted; sometimes 20 to 25 per cent. of butter is added; the stronger the butter the less is needed. The butter is added solely for flavor. The melted mass is now churned with either sour milk or buttermilk until an emulsion is formed; it is then run from the churn into pounded ice or ice-water, so as to chill it suddenly and prevent its crystallization. Some coloring is generally added in the churn to give it the proper tint of butter. The addition of coloring-matter was made a criminal offence by a recent act of the legislature of New York, an exception being made in favor of such products as are manufactured under U. S. patents. The butter-like mass is taken from the ice-water and worked in the same manner as ordinary butter. This artificial butter so closely resembles the genuine article when it is fresh that no one but an expert can tell them apart. There can be no objection urged against its sale that cannot be equally urged against the sale of genuine butter. It is only its sale under a false name that is to be condemned. Good oleomargarine is certainly superior as an article of diet to poor butter. The law in several of the States permits its sale, but requires it to be marked "oleomargarine." The practice of adulterating genuine butter with 25 or 30 per cent. of oleomargarine is said to be very common in the vicinity of New York, where the oil for the purpose is readily obtainable. Lard has also been used for the same purpose both in New York and in Chicago; if the amount used is not over 15 per cent. the fraud is very difficult to detect.

Cheese is made by the use of skimmed milk and the tallow oil, and is said to be fully equal in flavor to good whole-milk cheese. The oil is melted and stirred into the milk, and the cheese is then made and ripened in the usual way.

There is no very definite method of arriving at the amount of oleomargarine manufactured annually, but it is very large. One factory in New York makes twenty tons a day, and this is only one out of a dozen or more engaged in the business. The principal opposition to the manufacture and use of oleomargarine comes not from the consumers of it, but from the butter-dealers and producers, who find that its use interferes seriously with their trade.

Flour and Bread.—Cases of adulteration of flour and bread seem to be quite rare in this country. A number of examinations have been made in New York and New England to see if the bread sold by bakers contained alum, but these investigations have generally led to negative results, alum having been reported in but one or two cases.

Cream of Tartar.—This seems to be the most extensively adulterated of any substance investigated, the adulteration being mainly "terra alba," or gypsum. Acid phosphate of lime is frequently sold as cream of tartar, for which it forms an excellent substitute in bread-raising preparations. A great number of baking-powders are sold, some of which are made of cream of tartar and bicarbonate of soda, without any admixture of other substances, but this mixture does not keep very well. One of the most popular is made from this mixture, in which a little of the bicarbonate is replaced by carbonate of ammonia; the whole is then mixed with one-fourth of its weight of starch, the starch tending to keep the acid and alkali apart. Another popular powder is made from acid phosphate of lime and starch in one package and bicarbonate of soda in another, the two being mixed when used. A third kind, about which there has been much discussion, is made from alum and bicarbonate of soda: the manufacturers of other kinds of baking-powders assert that the use of this powder is very injurious to health, and they have waged a fierce war against it, until they have almost driven it from the market.

Coffee.—During the war, and for some time before it, the sale of adulterated coffee was very brisk; anything that would make a black bitter decoction could be sold for coffee or extract of coffee. The Government supplied the volunteers during the war with genuine coffee, and they thus acquired a taste for it which they did not forget when they came home, and this has injured the sale of the imitations. The articles used as substitutes were sometimes sold in bulk under their own name, but were generally sold in pound packages under some misleading title, such as "French breakfast coffee." These imitations sometimes contained a little coffee, but were and are still generally free from it; pease are a favorite ingredient, and other samples contain roasted rye. Extract of coffee is frequently made from burnt molasses, almond-shells being sometimes used to give the mass a more coffee-like appearance.

Tea.—The same adulterations have been reported in this article as have been found in England, but these adulterations do not seem to be very frequent. The genuine article can be obtained so cheaply that at present there is but little inducement to adulterate; some of the lower grades cost but ten or twelve cents per pound. The adulteration most frequently found consists in the use of exhausted leaves; this fraud is supposed to originate in China, as it would be difficult to obtain a supply of the necessary material in this country.

Sugar, Syrup, and Honey.—Most European writers make mention of the adulteration of sugar with starch-glucose, but few of them say that they have found it, and none give any accurate methods for its detection. Until recently chemists generally have been under the impression that starch-glucose, grape sugar, and invert-sugar were practically one and the same, and the directions given for the detection of starch-glucose merely served to show that some reducing substance was present. All commercial sugars, with the exception of the best refined white, the so-called centrifugals, maple and beet-root sugars, contain substances capable of reducing an alkaline solution of tartrate of copper. This may vary from a few tenths of 1 per cent., as in the highest grades of soft sugars, to as much as 15 per cent. in the dark molasses sugar, so that the common direction given in the books for the detection of glucose is misleading: glucose, or starch-sugar, as it is best to call it, is a different substance from any of the sugars found in the sugar-cane. The best grades found in the market are either in the form of a white, crystalline or non-crystalline mass, or in the form of a coarse powder having a dead-white appearance, entirely unlike the appearance of cane-sugar of the same color. Starch-sugar, when in this form, is known in the market as grape-sugar; the fine granular form is produced by grating the mass to powder; it can also be produced in the form of crystals, but this form has not been placed on the market to any extent.

A sugar has been placed on the market to a considerable extent under the name of "new-process sugar;" this is simply cane-sugar adulterated with starch-sugar. The starch-sugar can frequently be detected by simple inspection of the sample, the white amorphous particles of starch-sugar being readily distinguishable from the cane-sugar crystals. If the sample is shaken up with several times its volume of alcohol, the cane-sugar will be more readily dissolved than the starch-sugar; the latter retains its form after the cane-sugar is all dissolved. When a good polariscope can be obtained, it will definitely settle the question in regard to the adulteration with starch-sugar, and at the same time give approximate quantitative results. Starch-sugar always turns the rays of polarized light to the right. Some samples may show a higher polarization than others, but the direction is always the same; and this direction is not changed by treatment with hydrochloric acid, although the amount of polarization may be reduced. Cane-sugar also polarizes to the right, but on treatment with hydrochloric acid at 70° C. its polarization is changed to the left. Clerget has given a formula by which the amount of cane-sugar in a solution may be calculated from this change, provided no other substance is present which is acted upon by the acid. In its simplest form it is as follows:

$$P = \frac{200(S \pm S_1)}{288 - T},$$

in which S and S_1 equal the readings of the polariscope before and after inversion. The sum of these is taken if one is positive, or reads to the right, and the other is negative, or reads to the left; the difference is taken if they are both positive. T equals the temperature at which the reading was made after inversion; this must be very carefully observed, as an error of a degree will make a very sensible difference in the final results. P equals the percentage of cane-sugar if the instrument is graduated to read in percentages of cane-sugar and the normal quantity has been taken for the test. If the solution contains only pure cane-sugar, then P will equal S. In the ordinary cane-sugars of commerce we generally find that P is one or two degrees lower than S. This is generally said to be due to the presence of other active substances upon which the acid acts in a different manner from what it does upon the cane-sugar. If the sugar under examination contains any considerable amount of starch-sugar, the reading after polarization becomes smaller, and when the starch-sugar exceeds 25 per cent. will even become positive.

The starch-sugar is not very constant in its relations towards polarized light; some samples will polarize as high as 130°, while others will polarize only 60° or 70° on the instrument graduated to read percentages of cane-sugar if the same amount is taken as would be taken of cane-sugar. The samples polarizing the highest contain dextrine; this is readily acted upon by hydrochloric acid, and its polarization is reduced, but it never falls below 60°, and if the action is of only short duration it is but little affected. This change of course introduces an element of uncertainty into the calculation if we attempt to find how much starch-sugar is in a given sample, but it does not prevent the detection of the adulteration.

Sugar-house syrup is more extensively adulterated than sugar; a large proportion of the syrup sold in the West is merely starch-syrup flavored with about one-fifth of sugar-house syrup. This fraud is even easier to detect with the polariscope than the adulteration of sugar. Sugar-house syrups rarely polarize over 40°, while the mixed syrups generally polarize over 110°, so that no inversion is needed to detect the fraud; indeed, the mere appearance and taste of the sample will often detect it. The starch-sugar has generally a slightly bitter taste that remains on the tongue after the taste of the cane-sugar has disappeared.

Maple syrup coming from Chicago, and labeled "pure Michigan maple syrup," was found to consist of starch-glucose flavored with maple-sugar. Pure maple-sugar consists almost entirely of cane-sugar, and only contains traces of other sugars, and the syrup differs from the sugar only in containing more water.

Honey is manufactured on the same plan; only here the bees are employed to assist in the fraud. They are furnished with a supply of starch-sugar, which they store in their combs; when these combs are also fraudulent, being made from paraffine and furnished to the bees, who fill them with glucose and cap them with genuine wax, it is difficult to see how the art of adulteration could be carried further. Genuine honey polarizes light to the left, while that containing cane-sugar or glucose polarizes to the right. Bees fed on cane-sugar or molasses produce genuine honey, since they are able to invert the cane-sugar.

Candies are very generally adulterated with starch-sugar. This varies in amount with the grade of the goods, the cheap hard candies containing the least, while the high-priced "creams" frequently contain as much as 25 per cent. It is used in the latter to keep them soft and give them the cream-like appearance. It certainly makes a nice confection, and when it is pure and free from acid and excess of gypsum it is difficult to find any objection to its use that will not equally well apply to cane-sugar; its food-value is probably about the same.

Some years ago poisonous colors in candy were not uncommon, but so much has been said and written on the subject that of late it has become difficult to find them. The same may also be said of candies weighted with "terra alba," or gypsum.

Spices.—These have long been a favorite article on which to practise the art of adulteration. The only safe way to buy spices is to purchase the unground and grind them at home in small quantities as wanted for use; for, while many manufacturers do grind and pack pure spices, a spice never keeps as well after it is ground as it does in the whole state. The most common adulteration at present is the mixing in of lower grades of the same goods, the higher grade being used for name and flavor. Black pepper is adulterated with lower grades and with roasted ship-bread. Mustard is frequently mixed with flour and colored with turmeric or with a lake made from Persian berries. Some works give the amount of oil in the mustard-seed as an index of purity, but in this country it is a common practice to press the seeds after they are crushed and before grinding. This pressing removes about two-thirds of the oil. The mustard is said to grind more easily and to keep better than when it contains the full amount of oil.

Capsicum is sometimes adulterated with logwood, and is said to be colored with oxide of iron. In regard to oxide of iron, it may be remarked that samples of the pods have given as much oxide of iron as was found in those alleged to be adulterated.

A very fair imitation of cassia is made by grinding almond-shells and flavoring them with oil of cassia. This fraud can be detected with the microscope.

Canned Goods.—The rapid settlement of the mining-regions of the West by a class of men who have plenty of money at their command, and the inability of the region to supply them with food, have created a great demand for canned goods of various kinds. These are very generally of good quality and well packed. But sometimes inferior tin plate is used in the cans, and they are carelessly soldered, and thus become contaminated with lead. A large trade is carried on along the coast of Maine in packing fictitious sardines. These "sardines" are either smelts or the better parts of the porgy. They are packed in cotton-seed oil instead of olive oil. They make a palatable dish, but they are not sardines.

Cotton-seed oil has come into use largely of late years as a table oil; it is sold under the names salad oil or sweet oil, and very often as olive oil. These names are all fraudulent, since the purchaser generally expects to get olive oil. It is a sweet, bland oil, but it has no flavor, and is much inferior to olive, or even mustard-seed, oil as a table oil. Machinery olive oil is frequently adulterated with it: for oiling wool or machinery it is worthless, as it rapidly gums when exposed to the air. Mineral oils are used for adulterating animal and vegetable oils; they are easily detected by their fluorescence and by their failure to saponify when boiled with alcoholic potash. Lard oil is also adulterated with cotton-seed oil.

The soda-water sold from fountains long ago ceased to have any soda in it; it is merely water impregnated with carbonic acid gas. The syrups used with the water are generally flavored with the so-called fruit-essences: these are of artificial origin, being mixtures of various ethers. A solution of saponin is used to give the foam, and thus enable a skilful dispenser to fill a half-pint glass with about two table spoonfuls of liquid.

Drugs and Medicines.—Dr. Diehl reports to the National Board of Health as follows: "The drug market must be unqualifiedly pronounced to be fair. That is to say, not that poor and adulterated drugs are absent in the market, or that inferior medicines are not dispensed in our pharmacies, but persons who know, or who really desire to obtain, articles of standard quality have very little difficulty in so doing, and as a general rule can be suited by respectable dealers through the land. On the other hand, ignorant persons, or those regulating their purchases by prices rather than by the quality, and being consequently indifferent to the character of the dealer, are very likely to meet with low-grade and adulterated goods, or at best are frequently supplied with goods of an indifferent character." The chief complaint against drugs seems to be not adulteration, but inferior quality; this arises partly from carelessness in gathering, and partly from deterioration after the drugs are collected. Prof. Diehl gives a long list of sophistications that have been met with during the past ten years; a large proportion of these fall into the latter class.

Paints and Colors.—The chief complaint in regard to paints comes from the substitution of zinc-white and barytes for white lead, the mixture being sold as pure white lead. For some purposes the substitute is better than the original, but the zinc and barytes do not have the covering-power of the pure lead. In places exposed to hydric sulphide they do not darken as lead does. Some samples of vermilion consist of red lead brightened with eosine. Logwood extract is largely mixed with molasses. Sugar has been used to adulterate the aniline colors; the color, dissolved in alcohol, is sprinkled over the granulated sugar; the alcohol, evaporating, leaves the sugar coated with the color.

Wines, Beers, and Distilled Liquors.—In adulteration of these articles there seems to be but little peculiar to this country, and the remarks in regard to drugs apply equally well to them.

In *Textile Fabrics* the most extensive adulteration is carried on in woollen goods; shoddy is freely used. For many classes of goods cotton is carded with the wool; this cotton may amount to as much as 70 per cent. of the weight of the goods, and yet the goods will still have the appearance of being made of wool. This is particularly the case in regard to white goods, such as flannels and blankets. Knit underwear, known in the trade as merino, consists largely of cotton. These mixed goods when uncolored wash and wear better than pure wool, the only fraud being in selling them as all wool.

(S. P. SH.)

ADULTERY. In most of the United States adultery is regarded both as a crime and as a breach of the marriage contract. In each respect, but especially the former, the legislation of the different States is amazingly at variance.

See Vol. I. p. 160 Am. ed. (p. 177 Edin. ed.).

I. As a crime adultery is unknown to the common law, and its punishment depends wholly upon the statutory law, which is silent upon the subject in Delaware, Idaho Territory, Louisiana, New Mexico, Tennessee, and Utah. Unless otherwise defined by statute, adultery is the voluntary sexual intercourse of a married person with one to whom he or she is not married, but in the statutes of many of the States the term is used with great latitude of signification. In Arkansas, Nevada, and New York it is only punishable when incestuous, and in Arizona Territory when incestuous or when committed by divorced persons with each other. In the States of Florida, Iowa, Maine, Missouri, and Rhode Island it is provided that if one of the parties to the act be married, both are guilty of the crime. In Massachusetts, Minnesota, Michigan, Oregon, and Wisconsin both are guilty if the woman be married, although the man be unmarried; and the law is the same in Vermont if the man be married and the woman unmarried. In Arizona Territory, Maine, Massachusetts, Michigan, Mississippi, Nebraska, and Wisconsin it is made adultery for persons divorced from the bond of matrimony for whatever cause to cohabit; in New Jersey it is only so called when the parties have been divorced for adultery or a prior marriage. In Connecticut, Dakota, Iowa, Kentucky, Maine, Massachusetts, Minnesota, Maryland, Michigan, Nebraska, New Hampshire, Oregon, Pennsylvania, Vermont, Virginia, West Virginia, and Wisconsin a single act is sufficient to constitute the crime: while in Alabama, California, Georgia, Indiana, Mississippi, Montana Territory, North Carolina, Ohio, South Carolina, and Texas it is necessary that there shall have been continued cohabitation; and in Colorado, Florida, Illinois, Missouri, and Washington Territory this must also be open and notorious. In Colorado, Georgia, and Illinois the punishment for adultery (so called) may be suspended by the marriage of the guilty parties if no legal impediment exist, in which case, of course, the offence would not have been adultery in its original technical sense. The punishment for the crime of adultery ranges in severity from a fine of $10 in Maryland to a possible imprisonment for five years, together with a fine of $1000, in Vermont. In Iowa, Michigan, Minnesota, and Oregon no prosecution can be commenced but on the complaint of the aggrieved husband or wife, and in the three last-named States within one year from the time of the commission of the offence or (in Oregon) the time when it shall have come to the knowledge of such husband or wife.

II. In its civil aspect the definition of adultery already given (I.) is equally applicable. As a breach of the marriage contract a single act of adultery committed by either husband or wife is an absolute ground for divorce from the bonds of matrimony in all of the States except South Carolina, where no divorce law exists at all; Maine, where it is left to the discretion of the court; and Kentucky, North Carolina, and Texas, where living in adultery on the part of the husband is necessary, but a single act of adultery by the wife is sufficient to entitle the aggrieved party to a divorce. In all cases, however, collusion, condonation, or recrimination (*i. e.*, proof of the same offence committed by the complainant) will defeat the action. The law of Dakota provides that after a divorce for adultery the guilty party shall not marry again; in Delaware, Louisiana, and Tennessee the restriction is only against marriage with the paramour. In Georgia, Maryland, and Mississippi it is left to the discretion of the court in passing the decree to insert this stipulation. The New York law also prohibits the guilty party from marrying again during the lifetime of the other, but it is within the power of the court in which the judgment was rendered to modify this decree upon satisfactory proof that the complainant has remarried, that five years have elapsed since the decree, and that the defendant's conduct has been uniformly good. In those States in which this disability is not actually prescribed it of course does not exist in case of an absolute divorce, and the offence is never punishable merely under the general law against adultery. It may be remarked also that the prohibition against remarriage has no extra-territorial effect, and will not invalidate the marriage of either party out of the State in which it exists.

The effect of adultery of either husband or wife upon the legitimacy of the children of the marriage is affirmatively provided against in Colorado, Delaware, Georgia, Illinois, Maine, Mississippi, Missouri, North Carolina, and Texas, the laws of which declare that the legitimacy of the children shall not be affected. By the statute of New Hampshire the children are legitimate unless it is otherwise expressed in the decree. In case of a divorce for the adultery of the wife in Arizona Territory, Michigan, and Nebraska it is provided that the legitimacy of the children may be determined by the court, but in the case of children begotten before the commencement of the suit it shall in every case be presumed; while in California, Dakota, and Idaho Territory this presumption extends only to those children born or begotten before the act complained of; but in California and Dakota, when the husband has been the offender, children begotten at any time before the commencement of the suit are unaffected. Wherever the law is silent upon the subject the legitimacy is open to investigation, but there is the usual presumption in its favor so long as the marriage relation exists.

In order to enable the wife to obtain alimony the law of some of the States—as Pennsylvania, for example—allows also a divorce *a mensa et thoro* for adultery; but in other States, even though the divorce be absolute, provision is made for the wife. The general results upon property rights which follow divorces for this cause are more properly cognizable under DIVORCE, (*q. v.*). (N. D. M.)

ADVAITA (Sanscrit), a Hindoo philosophic term, equivalent to Non-dualism, or Monism. It denotes the belief that Brahma is the only existence, the universe being merely an emanation from this World-Spirit. Human souls are part of this being, and at death are absorbed in it as air contained in a vessel is merged in the atmosphere when the vessel is broken. The ignorance which causes men to regard themselves as separate can be removed by a proper understanding of the Vedas. This doctrine, which has had a most important influence on Hindoo philosophy, can be traced back to the time of the Veda hymns; but it was first fully developed in the Vedanta system, and especially by the commentator Sankara, who appears to have lived in the eighth century after Christ.

ADVANCEMENT, in law, a gift by way of anticipation from a parent, or one standing *in loco parentis*, to a child of what it is supposed such child would otherwise inherit at the death of the parent. The effect of an advancement is to decrease the child's distributive share in the parent's estate correspondingly. No particular formality is requisite to constitute a gift an advancement unless such formality be prescribed by statute. Every gift from a parent to a child which is in the nature of a portion, or which seems to contemplate the settlement of the child for life, is *primâ facie* an advancement. This presumption may be, however, overcome by proof that such was not the donor's intention. A trifling gift is never considered as an advancement, nor is the expense involved in the maintenance and education of a child.

Where security is taken for repayment of money, the amount lent by a parent to a child is never deemed an advancement, but rather a mere debt.

A child to whom property has been advanced may usually elect on the death of the parent to bring that property into *hotch-pot*, and will in such case be entitled to an equal share with the other children in the estate. (L. L., JR.)

ADVANCEMENT OF SCIENCE, ASSOCIATION FOR. See ACADEMIES OF SCIENCE.

ADVENTISTS, a body of Christians, including several branches, who believe that the visible, personal coming of Christ, the Second Advent, is near at hand, and that at this coming the millennium will begin. The doctrine of the millennium, as held by the Adventists, is substantially the old doctrine accepted in the early ages of Christianity. Justin Martyr, Irenæus, Tertullian, and others of the Church Fathers were Millenarians, believing that Christ would come to reign with the saints a thousand years, the earth being renewed for their abode. Without attempting to trace the course of the doctrine, it is sufficient to say that this temporal view was opposed by Jerome, Augustine, and others of the post-Nicene Fathers, who regarded the millennium as a period for the triumph of Christ's spiritual kingdom on earth, the Church. Many looked for Christ's personal coming at the end of the first thousand years of the Christian era. Similar views were held in the Middle Ages and after the Reformation; especially among the Lutherans there were many who studied prophecy and the events of the times, and found grounds for believing that the second advent was near at hand. Bengel, the commentator of the last, and Koch of the present, century, have advocated this doctrine, which is held to some extent by Christians in nearly all the denominations, an evidence of which is the Pre-millennial Conference which met in New York City in Oct., 1878, ministers from the Baptist, Presbyterian, Methodist Episcopal, Protestant Episcopal, and Reformed Episcopal churches being present and reading papers. A similar conference was held in London in 1873.

The movement to which the Adventists owe their origin may be said to have arisen in 1831, when William Miller began to proclaim the near personal coming of Christ. The first pre-millennial work published in this country is supposed to have been that of Samuel Hutchinson of Boston in 1667, and down to the close of the seventeenth century fifty similar books are said to have been issued. The most important publication of the kind in the last century was probably Spaulding's. Early in the present century there were several such publications, and it is claimed that the *Herald of Gospel Liberty*, established in 1808, advocated premillennial views. But William Miller was the founder of the denomination, and the members have accordingly been vulgarly called "Millerites." Mr. Miller was born in Pittsfield, Mass., in 1781. He removed to Low Hampton, N. Y., where he was converted in 1816. Abandoning his former deistical belief, he became an attentive reader of the Bible. He speaks of being astonished at the "beauty and glory" of the Scriptures, in which he found a "remedy for every disease of the soul," and "everything revealed" that he wished to know. He joined the Baptist Church, held prayer-meetings in his house, and was a very active worker for the advancement of the religion he had formerly sneered at. He applied himself more and more closely to the study of the Bible, laying aside all commentaries and other helps and drawing up certain rules of interpretation for his guide. In his examination of the prophecies he satisfied himself that the end of the world was to come before, not after, the millennium; that the second advent of Christ was to be personal and pre-millennial; and that this advent was near at hand. In support of these conclusions, as derived from prophecy, he found, he said, great help in chronological arguments. He discovered that the prophecies in the Old Testament for which a period had been announced were all fulfilled in the time specified. Days were often used, he also ascertained, for years. Thus, the "seventy weeks" to the Messiah were fulfilled in 490 years, the 1260 days of the papal supremacy in 1260 years. "Day" also means, sometimes, an indefinite period, and sometimes a thousand years. With this principle established, he believed that if he could ascertain when the prophetical days began he could foretell the date of the advent. The "seven times" of Gentile supremacy spoken of in Daniel iv. must begin, he thought, when the Jews ceased to be an independent nation, which was at the captivity of Manasseh, B. C. 677; the 2300 days (Daniel viii. 14) began with the seventy weeks, which dated from B. C. 457; the 1335 days of Daniel xii. 12 began on the setting up of the papal supremacy, which he fixed at A. D. 508. Then, he wrote, "reckoning all these prophetic periods from the several dates assigned by the best chronologers for the events from which they should evidently be reckoned, they would all terminate together about A. D. 1843. I was thus brought in 1818, at the close of my two years' study of the Scriptures, to the solemn conclusion that in about twenty-five years from that time all the affairs of our present state would be wound up; that all its pride and power, pomp and vanity, wickedness and opposition, would come to an end; that the kingdom of the Messiah would be established in place of the kingdoms of the world, the curse be removed from the earth, death be destroyed, and reward be given to the prophets and saints." The next five years Mr. Miller spent in proving his work and answering objections which rose in his mind. He was then fully convinced of the correctness of his conclusions, but it was not until several years later (1831) that he overcame his reluctance to proclaiming his views publicly and warning the world of its danger. His first lecture, in the church in Dresden, N. Y., was well received, and he soon found himself surrounded with large assemblages, while invitations came to him from churches of several denominations. The next year he published his views in a country newspaper, and in 1833 in pamphlet form. The doctrines advocated received much attention, and many accepted them. Mr. Miller speaks of eight ministers preaching them in 1833. The movement was now making considerable progress. In 1834 a journal was started to advocate it. Mr. Miller was almost constantly writing and lecturing on the subject. Converts multiplied and opposition arose. There was also a rapid increase of advent literature, which was widely circulated. Among the leading ministers of the movement were Charles Fitch, Congregationalist; Josiah Litch, Methodist; T. Cole, J. V. Himes, and L. D. Fleming of the Christian Connection; and H. D. Ward of the Protestant Episcopal Church. In 1840 a general conference of the friends of the "Advent Message," as it was called, was held in Boston. The conference did not propose a new organization, but met simply for discussion. The result was the issue of an address in which it was stated that while the conference was not agreed as to the particular year of Christ's coming, it was unanimous in the belief that it was "nigh at hand." Conferences of this character were held in 1841 in New York City, Low Hampton, N. Y., Lowell, Mass., Portland, Me., and other places, and an increasing number of ministers and journals, tracts, and books helped to spread the advent doctrines and add to the general excitement in view of the near approach of the end of the world. The following year was a year of still greater activity. Camp-meetings were held, and tent-meetings resorted to in towns and cities where it was difficult to get churches or halls, the opposition to the Adventists or Millerites having everywhere become very strong. Miller and his followers were regarded by many as fanatics turning the world upside down, and many newspaper articles and more elaborate treatises were written to show that their conclusions were based on no solid foundation. In November of this year *The Midnight Cry*, a daily paper published in New York City, was added to the list of new journals started by the Adventists. It continued as a daily nearly a month, and then became a weekly. In this year some of the lecturers carried the "message" into the cities of the West. In response to the general desire to have a more definite date assigned for the end of the world than "about the year 1843," Mr. Miller expressed the opinion that the great event would take place between March 21, 1843, and March 21, 1844. He told his followers that in a few short months the work of salvation would be ended for ever, and exhorted them to renewed diligence. The earliest date fixed upon by any of the Adventists for the coming was Feb. 10, 1843. The next date was the 15th of the same month. The third disappointment was the passing of April 14, the season of the crucifixion, without the expected appearance. The zeal of the preachers was not, however, relaxed; they raised the cry of warning in all parts of the country, and there were many strange scenes in consequence of the expectation, excitement, and disappointment of those who waited confidently for the Lord's coming. Mr. Miller confessed, after he had seen the latest date pass uneventfully by, that he had been in error and was disappointed; nevertheless, he believed that the "day was near at hand, even at the door." The effect of the failure on the mass of Miller's followers was to scatter and divide them. They had been formed into no organization, congregational or otherwise, and when the bond uniting them—their common expectation of the advent of Christ—was snapped, they broke up to form different parties, and to return, many of them, to the churches with which they had previously been connected. Others continued to believe in the near coming of Christ, and such were generally shut out of the churches. Some of the ministers who had embraced Miller's views renounced them, and were restored to the confidence and fellowship of the brethren of their respective denominations. Those who remained faithful to the millennial doctrine were not at one among themselves. Elder S. S. Snow made a re-examination of the prophetic numbers, and of the dates of the events to which they were supposed to apply, and he came to the conclusion that a mistake of a year had been made, and that the advent would take place in 1844. At first, few of the leaders believed his prophecy. Mr. Miller would not for a time accept it, but at last he gave it his indorsement, and the excitement of 1843 was renewed. Meetings were multiplied. Farmers left their crops unharvested (it was the fall of 1844), carpenters deserted the bench, and men in other pursuits left their business and gave their time to the study of the Bible and to religious gatherings. A new paper, *The True Midnight Cry*, was started to advocate the new date, and some other advent journals also supported it. The date assigned was Oct. 22, 1844. As the time approached there were few of the watchers of 1843 who did not believe that the new calculation was correct. Miller said if this proved erroneous he should "feel twice the disappointment" he had felt at the former failure. The *Advent Herald* issued Oct. 16 a large issue as its last one. Secular business was generally suspended and preparation made to meet the Lord. Some arrayed themselves as for an ascension, left their homes, and spent the last night of their supposed stay on earth in a tent. As the expectation had been more general and the excitement more intense than on the former occasion, the disappointment and chagrin were more bitter and embarrassing. The papers which were supposed to have finished their work resumed publication, and the preachers who had put away for ever the "severe and arduous labors" of lecture, "controversy, and entreaty," and prepared for the "endless rest of the saints," found they still had something to do. Mr. Miller opposed all further efforts to fix a time, and said he would cry, "To-day! to-day! until He comes." In this view the more moderate of the leaders concurred, but some have continued to predict dates even down to the present. Not unnaturally, considering the intensity of the excitement, some of the more fanatical were led to commit excesses and subject themselves to the reproach and condemnation of all sensible men. One party professed the gift of vision and miraculous powers; another taught that it was sinful to organize churches, and that the woes pronounced against Babylon were meant for all churches, both Roman Catholic and Protestant; and another party proclaimed the "shut-door" theory, declaring that the saints were shut into the kingdom with the wise virgins and Christ, and the rest of mankind were shut out. Each party had a paper or two to advocate its peculiar views, and the result was great confusion. Mr. Miller is said to have received in one week as many as sixteen different papers, but few of which agreed. Many were at a loss what or whom to believe, and it was thought desirable by Mr. Miller and his friends to call a mutual conference at Albany in April, 1845. Mr. Miller himself called it to order, and was the head of a committee of twelve who reported a declaration of belief, which the conference adopted. The chief points of this document were that the second coming of Christ is to be visible and personal; that it is near at hand; that the earth is to be renewed for the dwelling-place of the saints; that the millennium is the thousand years which will intervene between Christ's coming (at which the righteous dead shall rise) and the second resurrection; and that it is the duty of ministers to preach the gospel unto the end, calling upon men to repent in view of the coming kingdom. It was also recommended that believers form churches and Sunday-schools, that preachers hold conferences and give lectures, and that advent literature be more widely circulated. Certain doctrines were also condemned: (1) the conversion of the world to Christ before the second advent; (2) the restoration of the Jews to national independence; (3) the claims to special illumination. Fellowship was denied to those Adventists who "require new tests as conditions of salvation, who practise promiscuous feet-washing and give the salutation kiss, who sit on the floor as an act of humility, shave their heads, and act like children in understanding." An address prepared by Mr. Miller was issued counselling moderation, avoidance of speculation and strife, more Bible-study and less writing, and caution in accepting the views of pretended leaders.

In this year (1845) Mr. Miller, in reviewing his labors, estimated that about two hundred ministers had embraced his views in the United States and Canada. It is claimed that the majority of those who remained Adventists after the disappointment of 1844 accepted the Albany platform. As to the whole number of Miller's followers, there were different opinions. When he died (in 1849) a leading New York daily paper spoke of his having had 30,000 or 40,000 disciples, whereupon one of his friends wrote to claim that the number was over 100,000 for a time, and that there were then (1849) 50,000. From this it would appear that fully one-half of the Adventists of 1843–44 ceased to be counted such at the time of the death of their leader. The decrease was so large and so rapid that many supposed that the whole movement had collapsed, but the influence of the Albany convention stimulated organization, and a much larger denomination exists to-day than at Miller's death.

After the Albany conference two causes of division appeared among the Adventists. While they were organizing societies and trying to bring order out of chaos, these causes were creating divergences which were to frustrate the efforts to unite all the followers of Miller on one platform. The two causes were the desire to fix another date for Christ's coming and the discussion of the doctrine of the immortality of the soul. In 1852, Elder Jonathan Cummings professed to find "new light on the commencement and terminus of the periods of Daniel." He claimed that the proper date to reckon from was A. D. 519, when the union of Church and State was proclaimed by the emperor Justin. Considering the 1260 days of Daniel as years, he brought the first period down to 1779; the 1290 days he so manipulated as to make them signify 30 years, and bring the next period down to 1809; then the 1335 days, reaching to the end of all things, were made to expire in 1854. This prediction soon had a number of zealous supporters, but many refused to accept this date, and much was written against it. The result was alienation. The believers in the new date held a mass meeting in Lowell, Mass., in Jan., 1854, and decided to establish a paper of their own. Accordingly, the *World's Crisis* was begun, but the flight of time soon proved that Cummings's calculations were no more trustworthy than those of Miller, Snow, and others had been, and the organ of the movement confessed, in May, 1855, that it had been "disappointed and mistaken." Cummings became the head of several "communities" in which there was a common treasury, but these soon wound up their affairs and he retired to private life. These "time" brethren, as those who looked for the end of the world in 1854 were called, had become separated, as has been shown, from the main body of Adventists. The questions of prophecy having lost much of their freshness and interest, they took up with alacrity the doctrine of the immortality of the soul, which had for several years been receiving attention. As early as 1842 a paper called *The Bible Examiner* had been established in New York, which had for its motto, "No immortality or endless life except through Christ alone." In a few years this view was adopted by many of the leading Adventist ministers. It was very generally held by the party which established *The World's Crisis*, but not by the main body, who were quite willing to receive the former into fellowship again and tolerate the difference on this point. A conference was held in Boston in June, 1855, with this object in view, but the "time" brethren refused to coalesce, and held a convention on the same day in Worcester, Mass. The lines of separation have never been united, but the two parties have changed places in respect to numbers.

The census for 1880 returns the number of confessed Advent believers in this country at 90,079, including 746 ordained ministers. These believers are classed as follows: Adventists (members), 11,100; Second Adventists, 63,500; Seventh-Day Adventists, 14,733. The ministers are similarly classified: Adventists, 107; Second Adventists, 501; Seventh-Day Adventists, 138. The churches are thus distributed: Adventists 91; Second Adventists, 583; Seventh-Day Adventists, 608. The number of Adventists reported in 1860 was, it is said, only 17,120; in 1870 they numbered 34,555. A printed list of ministers in *The Adventist Handbook* for 1881 contains only 425 names.

I. EVANGELICAL ADVENTISTS.—These are the original Adventists, representing the Albany conference. At the time of the rise of the party which fixed on 1854 as the last year of the world these Evangelical Adventists formed the main body, but the doctrine of the mortality of the soul, or life in Christ only, and other causes, drew upon their strength, and they have been gradually dwindling, until their numbers have now become insignificant. They believe in the immortality of the soul, the conscious state of the dead, and the eternal conscious suffering of the wicked. In other respects—the personal, visible coming of Christ imminent, the purification of the earth by fire for the abode of the saints, and the millennium beginning at the advent—they are like other Adventists. They organized in 1858 an American Millennium Association, which publishes a newspaper and some tracts. This newspaper, which claims to be "the oldest prophetic journal in America," in deference to a divided feeling as to the name of the body was published many years for one party as *Messiah's Herald*, and for the other as *Advent Herald*. The body has annual conferences in Massachusetts, New Hampshire, Pennsylvania, Vermont, and in the provinces of Quebec and Ontario, Canada. Every summer they hold a camp-meeting at Hebronville, Mass., They number, as estimated, about 9000. Their faith is set forth in fifteen articles, which treat of the canon, the nature of God, the divinity, humanity, and redemptive work of Christ, the office of the Holy Ghost, repentance and forgiveness, and regeneration, in the ordinary evangelical way; the seventh article declares that at Christ's advent the judgment will take place; the eighth, that the righteous will rise at Christ's coming, but the wicked at the end of the millennium, the former to life eternal, the latter to everlasting punishment; the ninth, that the living saints will put on immortality and with the saints of the resurrection be caught up to meet the Lord in the air; that (10th) the heavens and earth will be dissolved by fire and be created anew, and the eternal kingdom of God be set up; that (11th) salvation is by the free, unmerited favor of God; that (12th) the observance of the Sabbath is of perpetual obligation, and that it should be recognized as a memorial institution of Christ's work and resurrection and of the creation, and as prefiguring the perfect rest to be given "the people of God when the six thousand years of the history and age of this world shall have terminated;" that (13th) baptism expresses not only faith in the forgiveness of sin, but also in the resurrection of the saints; that (14th) the Lord's Supper was instituted for sincere believers, and is a constant memorial of Christ's atoning sacrifice; that (15th) the "exact time of the second advent is veiled in uncertainty," but the "prophetic Scriptures, in periods and events, are now indicating the near approach of the judgment."

II. SECOND-ADVENT CHRISTIANS.—These form the most numerous branch of the Adventists. As already stated, they were those who fixed on 1854 as the last year of earthly things. They have grown rapidly since they began to proclaim the doctrine of the mortality of the soul. They claim about 50,000 members, 1000 ministers, and 30 annual conferences in New England, the Middle and Western States, and the South, and also in Canada. General conferences are held for the Western and Eastern societies. The societies support two publication societies—one in Boston, the other in Chicago—and the American Advent Mission Society. A similar mission society was organized in 1854, and collected some money for home missions and missions in Switzerland and Italy. The latter were not long continued. Many years earlier three missionaries were sent to England, and about the same time a mission was established in the West Indies, but these efforts did not continue more than a year. The American Advent Mission Society, which is supported by all the churches both East and West, was organized in 1865 with special reference to the needs of the freedmen. The average annual contributions have been $6000, with which missionaries have been supported in most of the Southern States. At a "national convention" held in Worcester, Mass., in 1881, at which 93 delegates were present from the Eastern and Middle States and Canada, a declaration of principles and a form of "advisory covenant" were adopted. These were adopted also by a conference held in the West, with a basis of union with the Eastern Adventists, in the same year. The united organization, known as the Second-Advent Christian Association of America, held its first meeting in August of that year, twenty conferences being represented. The first four articles of the declaration of faith state the commonly-received doctrines of the Scriptures and the Trinity. The fifth article declares that Christ died to save men from eternal death, the penalty of violated law, while salvation is twofold—(1st) from the penalty of Adam's sin by the resurrection from the dead; (2d) from personal sin and its consequences. The next three articles treat of repentance, of baptism (believers should be buried with Christ in baptism, to show their belief in the resurrection of Christ and of the dead), of the Lord's Supper and the coming of Christ. The tenth article expresses belief in the everlasting destruction of the finally impenitent and the ultimate extinction of all evil. The eleventh article declares that the second coming of Christ is near at hand. The next two articles state that the earth will be renewed for the future abode of the saints, and urge that all church action point to the second advent. Three articles on church organization set forth the congregational system. The "advisory covenant" for the use of congregations takes the Bible as the only rule of faith, and permits liberty of thought, but denies sanction to the "*persistent* urging of doctrinal themes" not "essential to salvation." *The World's Crisis*, Boston, and the *Advent Christian Times*, Chicago, are the chief weeklies published forAdvent Christians.

III. Seventh-Day Adventists.—These form a compact, highly-organized denomination. They hold that the chronological argument in support of the date of October, 1844, as the end of the longest prophetic period of 2300 days, was correct, but that those who believe that any prophetic period given in the Bible reaches the second advent are in error. The event predicted was the cleansing of the sanctuary, not Christ's personal coming. The sanctuary referred to is not the earth, but the "true tabernacle" in heaven described by Paul, in which "Christ our High Priest is minister." As the priest cleansed the sanctuary of Moses yearly, so must Christ cleanse the heavenly sanctuary before his glorious coming. The end of the period of 2300 days in 1844 "brought us to the commencement of this last portion of Christ's work as Priest in the true tabernacle above, called the cleansing of the sanctuary—not a cleansing from physical impurities, but from the presence of our sins, imparted to it through the blood of Christ there ministered in our behalf." The Seventh-Day Adventists look for Christ's coming, as do those of the other branches. They believe that event is near at hand. "We are now in the time of the cleansing of the sanctuary, a period of brief but indefinite duration, reaching to Christ's coming." As all the prophetic periods have terminated, they say there are "no data from which to reason respecting a definite time for the Lord to come." This view of the cleansing of the sanctuary led to the placing of more stress on the law, the great original of which is in the heavenly sanctuary. This law cannot possibly be changed; therefore it is incumbent on the "second house of Israel," as on the first, to keep the fourth commandment. The observance of the seventh day was, however, probably begun before the force of this argument was seen. The Adventist church in Washington, N. H., began to keep the seventh day as early as 1844, in obedience to the teachings of Mrs. Rachel D. Preston, who had been a Seventh-Day Baptist before she joined the society. Elders Joseph Bates, James White, and J. N. Andrews were among the earliest permanent converts to this doctrine. Mr. White and his wife Ellen may be considered perhaps as the chief founders of the denomination. Mr. White was born in Palmyra, Me., in 1821. He preached the doctrine of the coming of Christ until 1844, when he is said to have accepted the views and visions of Elder Joseph Turner and Miss Ellen G. Harmon (who afterward became his wife), and advocated for a time the "shut-door" theory. He and Miss Harmon travelled together in the New England and Middle States, taking up the seventh-day question in 1845. He continued to work as an evangelist, laying, at the same time, the foundation of an extensive publishing business. He started the *Advent Review*, the weekly organ of the denomination, in 1850. It was published in Maine and New York till 1855, when it was removed to Battle Creek, Mich., the present headquarters of the Church. Here the publishing business grew so rapidly that three buildings were at different times erected to give it room. The publishing association, of which Elder White was president until his death in 1881, issues eight periodicals in English, Danish, Swedish, and German, and many books and tracts. The first church in Battle Creek was built in 1855. This was soon succeeded by a larger house, and in 1879 a fourth house (a tabernacle 105 by 130 feet in measurement) was consecrated. They also have in Battle Creek a college and a health-reform institute. They are zealous advocates of temperance, having in use three pledges—the teetotal, the anti-rum and tobacco, and the anti-whiskey. It is expected that every member of the denomination will sooner or later sign the teetotal pledge, which promises abstinence from alcohol, tea, coffee, tobacco, opium, and all other narcotics and stimulants. A summary of the belief of Seventh-Day Adventists is given in twenty-five articles. It is declared that the new birth implies two changes—a moral change, wrought by conversion and a Christian life, and a physical change, wrought at Christ's second coming, "whereby, if dead, we are raised incorruptible, and if living are changed to immortality in a moment;" that the Spirit of God is manifested in the Church through certain gifts spoken of in 1 Cor. xii. and Eph. iv.; that the dead are unconscious; that the resurrection of the righteous takes place at Christ's coming, and that of the wicked a thousand years thereafter; that the righteous will reign with Christ a thousand years in the New Jerusalem, judging the world and fallen angels, during which time the earth lies in a desolate and chaotic condition, where Satan shall be confined, and finally destroyed with the wicked; that then shall come the new heaven and the new earth. They practise feet-washing at the administration of the Lord's Supper, and also kissing, to some extent, as a religious rite. The visions of Sister White are regarded as spiritual manifestations, and are generally accepted by the members. They have been numerous, and on a great variety of subjects. The polity of the Seventh-Day Adventists is, like that of the other branches, congregational. Besides the church organizations, there are State conferences, and a general conference which meets annually. At the last annual session of this body (in 1881) 27 State conferences were reported, extending over a large part of this country and into Canada. The number of members returned in 1880 was 15,570. There were 640 churches and 114 ordained ministers and 116 licentiates. In the summer season much use is made of large tents for meetings; no less than seventy were employed in 1880. Funds for benevolent purposes are raised by systematic contributions, each member being expected to lay aside weekly a sum equal to one-tenth of his income. The amount contributed in 1880 was $62,000. Missions are carried on in this country among the English, French, German, and Scandinavian populations, and in Europe in seven countries. In Europe and Egypt there are said to be 400 believers. These foreign missions were begun in 1874.

IV. Life-and-Advent Union.—This branch was organized Aug. 29, 1863, at Wilbraham, Mass. It differs from the Advent Christians chiefly in holding that the wicked dead will not participate in the resurrection at all. This view had been proclaimed as early as 1848 by John T. Walsh in *The Bible Examiner*, an Adventist paper, and later by Elder George Storrs and others. It is not known how many churches and ministers are attached to this body. The number of members is estimated at from 6000 to 7000. The organ of the union is the *Herald of Life*, published in Springfield, Mass. The annual business-meeting is held on a camp-ground.

V. Age-to-Come Adventists.—These millenarians are more nearly in accord with those of Great Britain than with the other bodies of Adventists in this country respecting the literal fulfilment of prophecy. They believe in a future millennium in which Christ will reign personally instead of spiritually, and that Judah and Israel will be restored to their own land. As to the destiny of the wicked, they reject eternal torture and inherent immortality. Eternal life is only bestowed by God, through Christ, in the plan of redemption. They differ, however, from the great majority of Adventists, who believe in the destruction of the wicked, in holding that the earth will not be burned at Christ's second coming, but that the millennium precedes the final consummation. *The Restitution*, published for the branch, at Plymouth, Ind., has about 2000 subscribers. The churches are scattered over the Western States and Canada. No estimate of membership is given.

None of these branches, except the Seventh-Day, have established any college or general educational institutions. They have but little church property, and much of their activity consists in the publication of book, tract, and periodical literature. The ordained ministers usually derive their main support from their own exertions in various branches of business. (H. K. C.)

ADVERSE POSSESSION, in law, the enjoyment of real estate or incorporeal hereditaments in such a manner and under such circumstances as indicate that the enjoyment has been commenced and continued under an assertion or color of right on the part of the possessor, as opposed to some right or title set up by an adverse claimant.

Adverse possession for the time specified by the statute of limitations will vest a perfect and indefeasible title in the possessor. The law will, at the expiration of that time, presume that a grant has been made; and this presumption is incapable of being rebutted. In order, however, to produce this result the adverse possession must present certain distinctive features. It must be actual and uninterrupted for the whole statutory period. It must be visible, notorious, and distinct. In addition, it must be entirely adverse in its nature, not referable to any title derived from or through the opposing claimant or held in common with him. (L. L., JR.)

See Vol. I. p. 161 Am. ed. (p. 177 Edin. ed.).

ADVERTISEMENT. There are few if any departments of trade which in modern times have increased more rapidly in importance than the one department common to all its manifold branches—that for obtaining publicity for the dealer and his wares—the increase being equally apparent whether we examine the press or the accounts of manufacturers and dealers. The history of advertising, however, remains to be written, notwithstanding the attention which has been given to the subject by historians of the newspaper press, like Grant or Hudson, or such writers as Sampson, whose *History of Advertising* (London, Chatto & Windus) will be pronounced by the student curious rather than important. The date of the earliest English newspaper advertisement has not yet been ascertained. A religious book advertised in the *Perfect Occurrences of Every Daie*, etc., April 2, 1647, is now said to have been the first article advertised; another early announcement being that of a reward for two stolen horses in the *Impartial Intelligencer*, March, 1648. Books were for some time the only wares announced in the press, and the advertisement of tea in the *Mercurius Politicus* of Sept. 30, 1658, seems to have been the first innovation upon the custom. Advertising, however, must have grown rapidly in popularity, since before the end of the seventeenth century papers devoted exclusively to advertisements, and circulated gratuitously, had been issued. Advertisements "printed with little cuts and figures" are alluded to by Addison, showing that the practice of pictorial advertising—which survived so long, and perhaps had its last notable stronghold in the dailies of the Mississippi region, to whose readers nothing was more familiar than the cut of the runaway slave or of the river steamboat—dates from the first decade of the eighteenth century. Not until the beginning of the nineteenth does any system of arrangement or classification seem to have been adopted in the mother-country. Miss Alice Clay, in *The Agony Column of "The Times"* (London, Chatto & Windus, 1881), gives selections from the *Times'* advertising columns from 1800 to 1870, showing that at the first these "personals" were inserted for the most part by individuals seeking wives. At present the London *Morning Post* is of English journals that most affected by matrimonial advertisers. These advertisements form a conspicuous feature of certain French and German newspapers, and both in England and the United States periodicals devoted exclusively to their publication have been established—at times as a cloak for blackmailing operations. The "agony column" of the *Times* perhaps attained its maximum of importance during the siege of Paris (1870–71), when it was the great vehicle of communication with besieged residents of that city, the paper being photographed on a greatly reduced scale and sent in by carrier-pigeon post (see *Times*, Jan. 31, 1871). A similar use had been made of the New York *Herald's* "personal" column during our own Civil War.

The first number of the first regular newspaper published in this country—the Boston *News-Letter*, April 24, 1704—contained no advertisements, though it was announced that notices of "houses, lands, tenements, farms, ships, vessels, goods, wares, or merchandise, etc., to be sold or let, or servants run away, or goods stole or lost," would be inserted at rates ranging from twelve-pence to five shillings. All things considered, as the purely local circulation of the papers, the restricted sphere of the trader, and the smallness of the population and its poverty of developed resources, this country was at least as enterprising as England in the matter of advertisements at that period, just after the Revolution, whence we may date our modern journalism; and though England thereafter took and held the lead, it may be said to have been regained by America within the present generation. The first really great revolution in American advertising was inaugurated when, about 1833, smaller and cheaper newspapers began to take the place of the "blanket sheets," and short transient advertisements were encouraged by the newspaper publishers as being more profitable than annual advertisements or those taken at a reduced rate upon long contracts. Upon the 1st of January, 1848, the New York *Herald*, which not long before had begun to omit all cuts and typographical display, introduced the system now observed in all great newspaper-offices of taking advertisements only upon the basis of the single insertion, and for cash, the logical outcome of daily journalism. But while there can be no doubt that classification is an accepted principle, it may be doubted whether the system which excludes all cuts and display-type will be ever generally adopted. Modern American newspaper advertising may be said to date from about the time of the Civil War, and the "advertising agencies" should be ranked in the front rank of educating and stimulating influences. The system of advertising agencies was introduced by Mr. Orlando Bourne in 1828, though upon a small scale, both absolutely and relatively, when compared with such modern establishments as those of Rowell or Pettengill. The advertising agent is practically a broker or commission-dealer, who has acquired information as to the press in all parts of the country which the average individual advertiser needs, but could not obtain for himself without great cost and labor, and who not only advises the advertiser what medium to select, but relieves him of the task of communicating with the dealer who has advertising space to sell, and of superintending the faithful execution of the contract. Thus, such an agency will preserve files of all the newspapers in the country, with their advertising tariff and regulations, maintaining a credit with each, furnishing the advertiser with all the information he could obtain at the distant office of publication, charging him the same price that would be demanded there, transmitting the copy, and afterwards taking care that he receives all that he bargained for, thus occupying the double relation of the publisher's agent and the advertiser's representative. The agent is allowed a rebate of 10 per cent. or more by the publisher, whence he derives his profit. While the extensive local advertiser can doubtless deal directly with the newspaper to his advantage, the agency system is indispensable for those who desire most economically to reach a widely-scattered constituency, and deserves to be ranked among the most legitimate and useful of the labor-saving instruments the use of which is so peculiarly characteristic of modern society.

In 1867, when a tax was collected on advertisements, the annual expenditure in the United States for newspaper advertising was nearly $10,000,000. It had increased to $15,000,000 in 1873, and now (1883) is estimated by experts at $20,000,000. Inasmuch, however, as there are 10,611 papers in the country, of which 996 are published daily, our own conviction is that the expenditure more nearly approaches, if it does not exceed, $25,000,000. It is steadily increasing, and notably in the item of small advertisements, and at the same time, though advertising rates have advanced since the war, circulation has increased still more rapidly; so that, to say nothing of the gain through wider experience and improved methods, the same amount of money will now produce a much more advantageous result. Prices are higher than in England. For ordinary advertisements the New York *Times* and *World* charge 20 cents per line for each insertion, the *Tribune* 30, and the *Sun* and *Herald* 40, with from 50 to 100 per cent. extra for display. (The line of agate type occupies a space of one-fourteenth of an inch.) Business and special notices, and items in city-news columns or after the money article or the column devoted to marriages and deaths, are charged for at higher rates, ranging from 30 cents to $2.50 per line. The rates charged for space in such publications as the weekly editions of the *Sun* and *Tribune*, *Harper's Weekly* and *Harper's Bazar*, the *Scientific American*, and the most widely-circulated of the "family story-papers," are still higher, such journals offering the advertiser a widely-scattered and select constituency, and having an exceedingly limited amount of space of which to dispose. As compared with a daily newspaper of the same circulation, a good weekly is held to offer double the advantage to the general advertiser, insertion for insertion. For the great mass of rural weeklies 1 cent per line for each thousand of circulation may be taken as a fair average rate. A large amount of money is expended annually upon advertising in "trade journals," but in the great majority of cases it is expended to little purpose. The programmes of theatres of high class are, however, regarded as good mediums. As for advertising in papers to be distributed gratuitously, it is estimated to produce one-fourth or one-fifth of the effect that would be obtained through a paid circulation of the same size.

It is, of course, a truism that unless a widely-advertised article possesses intrinsic excellence its proprietor need not expect to popularize it and reap a fortune. But careful observers insist that the great advertiser frequently errs through over-boldness; that the limit of remunerative expenditure is often exceeded, and that more attention is given to sowing the seed than to reaping the harvest. Of many proprietors of nostrums, in particular, is this true; and the fact should be noted that medicines were among the earliest articles advertised in the British newspapers. It is almost inevitable that within the brief period of a few years a superior or a cheaper article of the same description will be brought out, or that the public will select with irrevocable arbitrariness some other advertiser as its favorite; hence the advertiser's object should be, having attracted wide attention and obtained a market as large as he can supply, to reap the profit of his investment in printer's ink before another advertiser usurps his place. That the money expended in advertising an article of which everybody has heard who is likely to be a purchaser is wasted is as true as that no amount of advertising will restore to public favor an article which has once lost prestige; and where the annual expenditure is from $80,000 to $200,000 the cost of "advertising for the sake of advertising"—to adopt a phrase from the vocabulary of art-criticism—during the three or four years that the nostrum enjoys its extreme vogue, just represents the fortune the advertiser should have made. This fact will account for the shrinkage of many of the fortunes made, or reputed to have been made, by phenomenal advertisers. A patent medicine upon which ten years ago $250,000 was spent annually for advertising is now but little heard of. Within twenty years four dynasties of "bitters" manufacturers have reigned, the latest patentee having made at least a million dollars by advertising. A similar fortune has been made by a physician of Buffalo. The advertising bills of the proprietors of the three popular remedies of the day amount to $400,000 a year. One of these manufacturers began business with his trade-mark for all capital, and within a year from the time when his proposition to advertise to the amount of $1000 was declined, being unsupported by security, made a contract with the same agency for advertisements costing $80,000. The largest advertiser in this line of business is a dealer in Baltimore, whose annual expenditure is from $250,000 to $300,000. The most fortunate manufacturers are those of the last generation, both in England and the United States, who, having a pill, a liniment, or an ointment of fair quality, succeeded in occupying the "family field." There being no particular reason why another salve, another liniment, or another pill should be substituted for one which fairly meets the requirements of domestic medical practice, the remedy already tested advertises itself. It is in the field of cosmetics and of remedies for special complaints, real or imaginary, that the competition is keenest and that the largest prizes are at present to be won by extensive advertisers. The life-insurance companies and manufacturers of sewing-machines rank among the great advertisers of the time. Still more extensive are the operations of the railroad companies that have lands to sell. The Union Pacific and Northern Pacific companies in particular have each expended $250,000 a year in advertising their lands. A more colossal operation was that of advertising the bonds of the United States, when the announcement was practically given to every newspaper in the country.

Any examination into the statistics of advertising is made difficult by the inevitable tendency of advertisers and of publishers to exaggerate the figures relating to their own share of the business. Nevertheless, some information concerning the advertising departments of the great American newspapers is herewith presented that will be found of value as well as of interest. Such exceptional cases as the publication of the mayor's message and other public documents during the Tweed régime in New York at a dollar a line, or the annual printing of the delinquent tax-list of Cook co., Ill., which compelled the Chicago *Tribune* to issue a supplement of 88 pages or 616 columns, the expense of publication being $15,000, do not need to be mentioned save as curiosities. The New York *Herald* of April 16, 1882, a sheet of 28 pages, contained 5428 advertisements, occupying 120 columns of space. The full-page advertisement is naturally the maximum. The *Herald* places its receipts from advertising at $1,500,000 a year. Inasmuch as it possesses a practical monopoly of certain classes of advertisements, and extends its space to meet the requirements upon it, the *Herald* occupies a position of its own, rendering the work of comparison difficult. The largest and costliest single advertisement ever published in the New York *Tribune* cost $3576. The New York *Sun*, whose size never exceeds eight pages, has repeatedly refused to sell a page of advertising space, although offers of $500 a column were made. Its ordinary terms for a full-page advertisement would be $1000—if displayed, about $1800. The largest sum ever charged for a single advertisement was $1000 per column for a two-column advertisement—a description of a new office-building, with plans. The Chicago *Times* has printed 106 columns of advertisements in a single issue, and the Chicago *Tribune* 104, the largest single advertisements costing respectively $1000 and $750. The largest single advertisement published in the Philadelphia *Public Ledger*—it had been refused once on account of its dimensions—cost $1200; the Boston *Herald's* largest advertisement cost $1065. It may thus be said that a full-page advertisement in a great American daily costs $1000, while the *Public Ledger's* figures hold true in the case of all papers of large circulation and limited advertising space, its ordinary range of price being from 40 cents to $100. Taking these papers as fair representatives of high-class journalism in America, we find that the New York *Sun* derives only 30 per cent. of its income from advertisements; the New York *Tribune*, 40 per cent. (as compared with from 50 to 60 per cent. during the period 1865–73); the Philadelphia *Public Ledger*, 56·6 per cent.; the Boston *Herald*, 60 per cent.;

and the Chicago *Tribune* and *Times*, each about 50 per cent. All these papers unite in reporting a marked increase in the volume of their advertising business since the close of the war, the New York journals and the Philadelphia *Public Ledger* setting it down as "much greater;" the Boston *Herald* placing the increase at 50 per cent., with 200 per cent. more Sunday advertising; the Chicago *Times* declaring from its experience the amount of advertising thrice as large as it was then, and the Chicago *Tribune* four times as large.

Not the least curious fact connected with American journalism is that the New York *Ledger*, which owed its first success to lavish advertising, announcements of a single story often costing $25,000, and an annual expenditure of $150,000 being by no means extraordinary, should resolutely close its columns against all advertisements, though almost fabulous sums have been offered for column's space or even a card.

Newspaper advertising, it does not need to be said, does not absorb all the money expended for the purchase of publicity. The other methods by which attention is invited are literally innumerable: many are strikingly ingenious, and not a few are successful. The consensus of opinion among experts is that these methods, when novel or striking, are advantageous as reinforcing newspaper advertising, though much of the money invested in subsidiary schemes of a commonplace character is absolutely wasted. During the last five years there has been an immense development of "picture-card advertising," nor has the mania—for to such proportions it has attained—yet reached its height. The cost of these cards varies from $2.50 to $50 per thousand, and 200,000,000 copies of one card—a flower with space for an advertiser's announcement—have been sold.

The English public is quite as liberal in the matter of advertising as the American, all things considered, and the great stores of Paris and some of the French manufacturers rival, if they do not outdo, those of the United States in expenditures for this purpose. But the volume of newspaper advertising in France is small. Of the receipts of the Paris *Figaro* during the year 1881, only 27 per cent. were derived from advertising.

Advertising circulars in the likeness or similitude of any circulating note or other obligation or security of the United States are illegal. According to a decision of the marine court of New York (Gade *vs.* Niemann) a contract to publish editorially a paid "puff" is not illegal nor against public policy. The United States circuit court in New York, in a recent case where copyright was claimed by a brewer in a chromo-lithographic advertisement which a rival had copied, ruled in effect that there may be copyright in a picture or literary composition used for advertising purposes, provided it be original and of artistic or literary merit. This follows the decision of the English court of appeal in 1882, where a dealer in furniture was enjoined from pirating the catalogue containing designs of furniture and upholstery prepared by another dealer for his own use, the court holding that the intrinsic merits of the production, and not the use to which the publication was to be put, determined the question of copyright. A curious case has also been decided by Mr. Justice Chitty, where the publishers of *Punch* obtained an injunction against an advertising agent whose habit it was to purchase large numbers of copies of that periodical at threepence each and to resell them at a penny, having meanwhile added a wrapper and "interleaves" occupied by advertisements. Though the agent submitted, upon advice, to the injunction being made perpetual, the decision has been criticised as not entirely in accordance with the public interest. Another recent English decision which has been attacked is that of Mr. Thomas Hughes at the Nantwich county court, where the proprietor of a newspaper, to avoid an action for libel, changed the word "machinations" to "doings." Payment was refused by the advertiser on the ground that the advertisement inserted was not that ordered for insertion, but Mr. Hughes decided that he must pay the bill—a ruling which, unless it be reversed, will confer upon English newspaper publishers the right to alter advertisements without losing their claim upon advertisers. If we may judge from some recent cases in the Western States, that rule in the code of professional ethics which forbids physicians to advertise will at no distant day provoke an interesting discussion. Justice compels the remark that in at least one case (in Michigan) the medical society has been rigidly consistent, having arraigned a member for sending out New Year's cards bearing his name, address, and profession to all the families in his county, writing frequent letters to the press on health topics, always signing his full name and address, and in other ways taking pains to make himself known professionally, though he neither advertised in the newspapers nor distributed handbills. (G. T. L.)

ÆOLIAN INSTRUMENTS. Æolian instruments have been in use from time immemorial. An æolian harp consists of a row of wires stretched across the lid of a closed box. The strings are tuned in unison, but are not tightly stretched, and then the instrument is placed in a current of air. When this current is strong the tones are similarly strong, and when it is more gentle the tones are correspondingly gentle. The harp conforms directly to every change, and seems to respond more like a highly sensitive being than insensate matter. The sounds vary not merely in intensity, but in pitch also. Supposing the note to which the strings are tuned to be G, this note or fundamental tone will not be heard, but the following notes in a continuously ascending series: G (the octave above), then D, G, B, D, F, G, A, etc., the numbers of whose vibrations in a given time are in the proportions 2, 3, 4, 5, 6, 7, 8, 9, etc. It will be noted that these tones approach each other more and more closely; hence the accords become less and less consonant until a point is reached when they are extremely dissonant. It therefore follows that when the wind is gentle the tones are not only soft and sweet, but so closely related, as regards the ratios of the vibration-numbers, that they are most perfect consonances; and when the wind is strong the tones are not only more brilliant and powerful, but more and more dissonant. There is in this a simulation of emotion.

Although the wind analyzes the compound tones of the strings in a manner similar to that in which a drop of water analyzes sunlight and displays a rainbow, yet the music of the æolian harp more closely resembles artistic music than the prismatic colors do paintings, for it seems to portray moods and the ever-changing conditions of the human soul. All gradations, from the softest conceivable musical sigh to the shriek and scream of passion, are caused by the varying action of the wind. It also lowers the temperature of the strings, and thus causes them to vary slightly in pitch, so as to produce slow, wavy beats. The tones then become tremulously undulating, and resemble the slightly wavering quality of the human voice which often betrays suppressed emotion. Many interesting analogies of a similar kind may be given by persons accustomed to listen to the sounds of the æolian harp.

On the ninth day of the ninth month the Chinese proceed to hills near the towns and fly kites of many various shapes and sizes, which are strung with strings that are strained across apertures in the paper, and thus an aërial chorus is performed. The tones given out by the various telegraph and telephone-wires on windy days in summer-time have become so powerful as to make their removal necessary. In the tenth century, St. Dunstan, on using an æolian harp, was accused of sorcery. A century ago the bell harp was much used in England. It consisted of a box about two feet in length strung with eight metal wires. The box was held by the fingers, and the thumbs operated the strings, but while performing the player swung his instrument, and thus the effect produced was somewhat similar to that of swung bells. When musical instruments are swayed from side to side, the waves of sound being lengthened or shortened, a fascinating undulatory character is imparted to the tones. Concertinas, accordeons, and other portable instruments are often swung to gain this effect.

Among the Malays and Singhalese a very long bamboo tube completely hollowed out is pierced with holes like an ordinary wind instrument, and placed in the trees near the house to be sounded by the wind. Some of these instruments are forty feet long, and are therefore capable of producing notes of very great depth. Organ-pipes are rarely longer than thirty-two feet. In the Soudan, a long, conical or trumpet-shaped instrument, made of thin sheet iron, is swung round and round by the outstretched arm, the hand grasping the handle, which is an extension of the small end. It is used for signals, producing sounds of considerable depth and significance when swung at moderate speed, and tones of increased pitch and power as the speed is increased. Fifers were called "whifflers" in the olden times, but it is possible that the "mighty whiffler" referred to by Shakespeare in *King Henry V.*, act v., line 12, is the instrument, "whiffler" or "whirrer," familiar to North American Indians and English schoolboys. It consists of a strip of wood notched on two sides. At one end a piece of string is attached in such a manner that the wood is free to revolve on its axis. The other end of the string is tied to a long stick, by which the whiffler is whirled round. When used in the open air, an exceedingly deep-toned note is at first heard. It appears to come from beneath the ground at some distance. As the speed of the revolutions increases the note becomes apparently nearer, is stronger and higher in pitch, and finally sonorous and firm in tone, and of a quality similar to a baritone voice. (S. A. P.)

AËROLITE, METEORITE, METEOROLITE. These names are given to stones which reach the earth from the air. There have been nearly 700 recorded cases of such. Some of the most striking are the following: A Chinese catalogue tells of one which on Jan. 14, 616 B. C., broke several chariots and killed ten men. In A. D. 1492, Nov. 7, "there was a clap of thunder and a prolonged confused noise which was heard at a great distance, and a stone which weighed 260 pounds fell from the air in the jurisdiction of Ensisheim." This was dug up and placed in the church, where it still remains. In 1803, April 26, about 1 P. M., a brilliant fireball traversed the north of France; a violent explosion was heard, and nearly 3000 fragments were picked up, the largest of which weighed 8¾ pounds. In 1876, Feb. 12, the people of Iowa and Missouri observed a bright meteor moving eastward, making a great noise as of frequent explosions, shaking buildings and frightening animals. Then came one final explosion, and it was no more seen. A little to the east of the end of its path were picked up about 800 pounds of stones, some on frozen ground and snowbanks. In 1876, June 28, about 11.50 A. M., a fireball of blinding brightness passed over Sweden. It was followed by a streak of fire, and was observed to split into various fragments in the air. The stones were picked up (near Ställdalen) in an oval about 6 miles long and 1½ miles wide.

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Up to 1795 it was supposed these stones were shot up from terrestrial volcanoes. Chladni's view, that they fell from the skies, was believed at that time by scientific men to be untenable. But it is now universally recognized that they are of celestial origin. It seems most probable that they are fragments of comets. Meteors are known to move in cometary orbits, and aërolites are large or refractory meteors. When one of these enters our atmosphere with planetary velocity it compresses the air in front of it, and produces so great heat as to be set on fire. In most cases it is entirely consumed. Those not consumed, when picked up on the earth are found to be covered by a smooth black crust, the result of fusion in the air. The side of the stone that moved in advance may be told by the greater thickness of the crust and by numerous cavities which seem to be formed by the grinding action of the air or by small particles of the stone. In the interior the structure is generally crystalline.

There are two kinds of aërolite. One is largely composed of iron, alloyed with from 3 to 14 per cent. of nickel; the other consists of various siliceous minerals, chiefly feldspars. The ferrous aërolites predominate, but Meunier considers that a larger proportion of siliceous ones fall in recent times than formerly. Prof. Nordenskjöld analyzed the Ställdalen aërolite, and compared the result with eight others, and his figures, omitting the oxygen, sulphur, and other non-metallic elements, are as follows:

Silica	26	per cent.
Magnesium	22	"
Iron	44	"
Nickel	3	"

with traces of cobalt, manganese, aluminium, sodium, potassium, chromium, and tin. Altogether, twenty-four elements have been found in meteoric stones, all of which had been previously known to exist on the earth.

In 1881, Dr. Hahn of Germany issued a book which gave the results of his microscopic investigations on thin slices of aërolites of a siliceous character. He announced that these contained fossil remains of animals. Other microscopists found various species of polypi, crinoids, spongiæ, and algæ, all resembling their terrestrial counterparts, in Dr. Hahn's specimens. The structure of the corals was well preserved, the stomata and rays in the cells fully recognized. Other scientific men of equal standing and facilities consider these appearances to be due only to mineral crystallization. The subject is now in doubt. If proved, it is a discovery pregnant with remarkable results, revealing the character of life in other worlds.

Besides stones, several instances are recorded of meteoric dust having fallen to the earth. Fine particles of iron and other substances have been found on snow, which probably came from the skies. The greater part of the ashes of meteors burned in the air must find its way sooner or later to the earth. A committee of the British Association has in charge the examination of observations hitherto recorded and the arrangement of more systematic investigations in the future. (I. S.)

ÆSTHETICS has to do with the theory of the fine arts, and does not treat either of the products of these arts or of their history. It deals directly with beauty and the conditions of its development. Yet, as the theory of art owes its interest to art itself, the chief motive to theory is found in the development of art. Landscape-gardening, architecture—especially religious, commercial, and domestic architecture—sculpture, painting, poetry, have found increasing development in recent years in the United States. More especially in the last few years attention has been directed to decoration in the details of domestic architecture and household furniture. Of the many works which have forwarded this result, it is sufficient to mention a few representative ones. *Landscape Gardening and Rural Architecture*, by A. J. Downing, has been a very valuable and influential book; *Lectures on Art*, by Washington Allston, and *Talks on Art*, by W. M. Hunt, bear more immediately on high art; *The House Beautiful*, by Clarence Cook, represents a class of works designed to promote decoration. There have also been produced a number of admirable works on the history of art, such as *Book of the Artists*, by Henry T. Tuckerman (1870); *Schools and Masters of Painting*, by A. G. Radcliffe (1876); *Painters, Sculptors, Architects, Engravers, and their Works*, by Clara E. Clement (1877); *Artists of the Nineteenth Century*, by Clara E. Clement and L. Hutton (1879); and *Art in America*, by S. G. W. Benjamin (1880). Among the more prac-

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tical arts, wood-engraving has been cultivated in the United States with unusual success.

The discussions which constitute æsthetics proper are those which pertain to the nature of beauty as an external object, to the faculties by which we apprehend it, and to the principles which govern its presence and cultivation. In addition to articles of criticism in our periodical literature, a number of works have been published having direct reference to the theory of art. Most of these have inclined to the intuitional view, which refers beauty to a rational insight of the mind into the higher relations of feeling as expressed by objects about us.

James Jackson Jarves has been for a long period an acceptable critic on art. Of his works in this direction we mention *Art Hints, Architecture, Sculpture, and Painting* (1865); *The Art Idea, Sculpture, Painting, and Architecture in America* (1864); *Art Thoughts* (1869). His works are largely historical, and his criticisms appreciative and kindly and fitted to awaken a more general interest. Sensitivity to art, rather than keen insight into its nature and principles, characterizes this author.

The earliest strictly theoretical work on æsthetics in America was *An Introduction to the Study of Æsthetics*, by Prof. James C. Moffat (1856). In his view the beautiful depends on the mind's conception of conformity in objects to its own nature. "That faculty of our spiritual nature whereby we combine the similar and set apart the dissimilar is our guide alike to the highest achievements of science and to every excellence in the domain of art." While beauty is thus made an intellectual rather than a sensible quality of things, Prof. Moffat still finds it present in objects which gratify the senses. The common characteristics which distinguish beautiful things from others are not given very clearly.

In 1862, *Æsthetics, or the Science of Beauty*, was published by Prof. John Bascom. While beauty is a quality which exists only for mind and in mind, its conditions are given in the external world. These conditions are fitting expression under felicitous form. The inner and outer, spirit and form, concur in the beautiful thing. When constructive emotional thought is embodied in a form suitable to it, the object becomes beautiful to the reason that perceives this union. Beauty lies along the line in which the physical and the intellectual unite freely in creative products. Both elements must be present. The worthy sentiment must find worthy expression. According to this view, beauty admits of every degree, expires at the limit of the commonplace, and stands in contrast with inadequate or ignorant or vicious expression. Beauty is the culminating quality which belongs to things or actions as the product of reason and addressed to reason. The acts, therefore, by which the mind apprehends the beautiful are—first, those of inquiry and interpretation, by which the expression, the intellectual qualities, of objects are understood; and second, that final insight, that act of reason, which discerns the harmony of means and ends, of spirit and form, in the object before it. The symbols which express beauty are those of the senses; the principles which control it are those of subordination, economy, and dignity. The work contains an extended discussion of the nature of the expression which is the basis of beauty. This expression is constructive, harmonious, and truthful. It is fitting in reference to the progressive thoughts of men. It has unity, and is in accord with the methods and laws of nature.

In 1867 appeared *Elements of Art Criticism*, by Pres. George W. Samson, D. D. This treatise opens with an extended discussion of principles, which is followed by a still more extended discussion of particular arts. The method is cumbersome and diffuse rather than clear or precise. Art addresses the mind through the bodily organs, yet it appeals to the mind as well as to the senses. These appeals are distinguished from purely intellectual impressions, in that they are always accompanied by sensation. Pres. Samson gives the sensational element especial prominence, and has but little to say of the intellectual element. "Beauty is that which in the qualities of an object affords pleasure to our sensibilities." Not only does he regard beauty as incapable of ultimate definition, but he thinks it impossible to determine why any object is beautiful otherwise than by directing attention to its qualities. "Having been asked why I regard an apple beautiful, and having mentioned the lines in its form and the tints of its color which give me the impression of beauty, if it be further asked why I regard such lines and such tints beautiful, I can only say that I am so made that I cannot but so regard them." In emphasizing the ultimate and sensible nature of the quality and of the act of mind by which it is discerned, he loses sight of the eminently rational conditions under which alone it arises. He thus misses, in large part, the very field in which any discussion on art can aid the mind. Form and color are treated as if they were ultimate terms in art, to be directly comprehended by simple vision.

Art: Its Laws and the Reasons for them, by Samuel P. Long, was published in 1871. This work opens with a discussion of beauty and the principles of art, and adds to the discussion an extended application of these principles in a criticism of the works of artists. Mr. Long, as is only too common in writers on philosophy, starts with a light estimate of the labor already done. He divides the theories of art into two classes—those which regard beauty as an inherent quality of objects, and those which look upon it as the result of contingent qualities. He decides in favor of the former class. Beauty is an essential, inherent quality; this quality is capable of receiving a standard; this standard in the human form is found in the Greek statues of Apollo Belvedere and Venus de' Medici. The term "perfect beauty" expresses a general idea, excluding all individual peculiarities of structure. The author thinks that this perfect beauty is natural beauty, the beauty of our first parents, and that the views of Darwin render a standard of beauty impossible.

Prof. Henry N. Day published in 1872 a treatise entitled *The Science of Æsthetics; or the Nature, Kinds, Laws, and Uses of Beauty.* He regards beauty as objective and real, and as embracing the three elements, matter, idea, idea in form. The divisions of beauty in kind are three—beauty in respect to the idea revealed, or ideal beauty; in respect to the revealing matter, or material beauty; and in respect to the disclosing form, or formal beauty. The laws of beauty are divided into two classes—those of production and those of interpretation. These laws are extendedly laid down and discussed—first under the three forms of beauty, and afterward in connection with each of the fine arts. The uses of beauty are found in its relation to the true and the good, and in its ministration to our higher nature.

A Theory of Fine Art, by Prof. Joseph Torrey, was the outgrowth of lectures delivered for a series of years in the University of Vermont; it was published in 1874. It discusses the nature of beauty and sublimity; the relation of beauty to nature; the cultivation of taste and the several fine arts. "The end of all the imaginative arts is to express the truth of things in sensible forms, and in such a way that these forms, so far as art is concerned, have no other use or purpose than simply to serve as the expression of truth in its unchanging nature." The beautiful is the true, reaching us, not through our understanding, but in some form of sense or imagination, being felt rather than understood by us. When the object cannot be presented as formally complete, but appeals to the reason with a force beyond the expression, it is sublime. Art works under the forms of nature, but not in simple repetition of them. She is possessed of æsthetic ideas, which are simply symbolized in these forms, and to these she aims to give expression.

The Beautiful and the Sublime, by John Steinfort Kedney, was published in 1880. He states his purpose to be an effort to reach those postulates of æsthetics which must have their justification in a constructive philosophy. The discussion is divided into two parts: beauty as subjective, and beauty as objective. This work is more psychological than its predecessors, and correspondingly more obscure. The subjective force of beauty is found in the ideal—in ideas which are the products of the mind. The mind is occupied with the attainable or with the desirable, with the actual or with the ideal, according to the balance of its own impulses. The ideal is always invested with a physical form, and so becomes an object of pursuit. The imagination gives construction to the ideal under all the symbols of sense, and the mind receives an ever-renewed delight from it. When one is lifted beyond his familiar ideal into something greater than it and only partially apprehended, occasion is given for the emotion of sublimity. Sublimity is of two kinds—mathematical and dynamical. The moral ideal gives rise to moral beauty and moral sublimity. Beauty on the objective side is real. "It is a display by the soul of the universe of the possible modes of soul-life, the infinite play of the Divine consciousness, the efflorescence in manifold ideas of the Divine Word." This objective beauty constantly advances; as the universe moves on, its forms are increasingly complete. Here, too, the ideal is drawing near to the actual, the actual is approaching the ideal.

A later and more voluminous work is that of Leopold Eidlitz, *The Nature and Function of Art, more especially of Architecture* (1881). While this work has its chief value as an extended treatise on architecture, it discusses also the general theory of art. The creative force which is seen in nature or in art is what we term "beauty." It is immaterial in what direction this creative power is shown, whether in that of vice or of virtue. Taste, the power by which we discern this energy, is not different from the power by which we discern skill of any kind or any form of mental activity. The magnitude of the creative force is the magnitude of the beauty. This energy is presented in art in material forms, and the pleasure of the beautiful is the admiration called out. The ideal, which is the object of art, lies in the direction of nature, and is thus approached by imitation.

In addition to these distinct treatises on beauty there are single suggestive articles on art, as one by Emerson, or series of articles, as the series by George H. Calvert.

The several theories now offered have so much in common that they seem ready to unite in a few general principles. Beauty involves two elements—a creative, emotional spirit, and a sensible form in which it finds expression. Taste is the power of discerning this coincidence. Art works under the conditions of nature, but is not confined to nature. What any one mind shall recognize as a creative, emotional work will depend on its cultivation and on its moral or spiritual state. No mind will regard any work as creative which is not in harmony with its own constructive ideas. Hence the moral or spiritual temper will reject the immoral or sensual production. So far as it is immoral it will seem to such a mind destructive, not constructive. Men will not agree in practical criticism in taste till they agree in their lines of cultivation and in their constructive judgments. The severe unity of results which is sought for in ethics and æsthetics is unphilosophical, because it can be gained only in limitation of the facts under consideration. The data are not fixed; no more can the theories be which expound them.

(J. B.)

ÆTIOLOGY (Gr. αἰτιολογία, assignation of the reason or cause of anything), in general, the science of causation, mediate or immediate. Modern ætiology differs from the old teleology, or doctrine of final causes, in seeking only to determine the efficient causes of observed results according to the evidence which may be presented, and in thus dealing only with what a teleologist would consider to be "secondary causes."

(E. C)

AETOMORPHÆ (Gr. ἀετός, an eagle; μορφή, form), a term invented by Huxley in 1867 to designate a super-family group of desmognathous carinate birds, equivalent to the *Raptores*, *Rapaces*, or ACCIPITRES of authors (see the latter). By this author the *Aetomorphæ* are divided into four families: 1, *Strigidæ*, owls; 2, *Cathartidæ*, American vultures; 3, *Gypaetidæ*, containing the Old-World vultures and all other diurnal Raptores, except, 4, *Gypogeranidæ*. These four groups are now commonly accepted as the primary divisions of *Accipitres*, though rated by many authors as of higher than family value.

(F. C.)

See Vol. I. p. 204 Am. ed. (p. 227 Edin. ed.).

AFGHANISTAN (since 1875). It is the misfortune of the Afghans to lie between two jealous and powerful empires, each of which suspects the other of intentions to extend its power over Afghanistan. In 1877 the khan of Kelat ceded to the English Quettah on the highway to Kandahar. Sher Ali, the amir of Afghanistan, claimed Kelat as a dependent and tributary power, and resented this transaction as an encroachment on his rights and the first step in an invasion of his dominions. The Russians, who were well informed of the changes of feeling in Kabul, and were smarting under their recent rebuffs at Berlin, sent in the summer of 1878 an embassy with a military escort, which entered Kabul Aug. 11th. Three days later Lord Lytton, the governor-general of India, wrote an autograph letter to the amir announcing his purpose to despatch an embassy to Kabul; and Sept. 21st the embassy set out, but was refused leave to pass through the Afghan territory. The amir replied to the letter of Lord Lytton Oct. 6th, complaining of the conduct of British officials along the frontier, and intimating his expectation of war. The British Cabinet, Oct. 30th, sent an ultimatum to the amir, demanding the right to maintain an embassy permanently at Kabul, and asked a reply by Nov. 20th. As none was received, orders were sent for the invasion of the country, and three corps were organized, including 34,000 soldiers and 20,000 camels for transportation. The first corps, under Gen. Stewart, was ordered to seize the Khybar Pass and force its way into the Kabul Valley. It opened the war by seizing the "impregnable" fortress of Ali Musjid Nov. 22d, the garrison having fled in the night on finding their guns silenced and their position almost surrounded. It then pressed on to Jalalabad, which it entered Dec. 20th. The second corps, under Gen. Roberts, advanced by the parallel valley of the Kurram, and after fierce fighting, which lasted the whole of Dec. 2d, drove back the Afghan forces. Gen. Roberts proceeded to force the mountain-tribes along the line of his advance to come to terms, and to co-operate with the first corps against Kabul. The third corps, under Gen. Biddulph, set out from Quettah for Kandahar, crossing a country of waterless deserts and rocky hills before it reached the valleys where this wild region ends. They encountered no resistance until close upon the city, which they entered Jan 12, 1879.

In the mean time, the Russian embassy had been recalled from Kabul, Dec. 17th, after Sher Ali had left his capital (Dec. 13th) to take refuge in the north. His son, Yakub Khan, recently liberated after a long imprisonment, had been left in command at Kabul with instructions to defend the city. For a time he did so, but when his father died (Feb. 21st) in the Russian territory, he proposed negotiations. But, as he made a guarantee of his succession a condition of peace, the English resumed their advance from Jalalabad April 1st, crossed the Kabul River on the 10th, and advanced upon the capital. A battle at Nimla Bagh resulted in the repulse of the Afghans, and the English pressed on to Gundamak, close upon Kabul. After some negotiations, Yakub Khan left the capital May 30th, and entered Gundamak May 18th. A treaty was signed May

26th, by which England secured an accession of territory on the Punjab frontier, including the Khybar and Peiwar passes and the Pishni valley, with the right to maintain a permanent embassy in Kabul and the right to "advise" the amir with reference to foreign affairs.

In pursuance of this treaty Major Cavagnari entered Kabul July 24, 1879, as British ambassador, and on Aug. 9th the British troops began to evacuate the country. But before this was completed Major Cavagnari and his suite were murdered in an uprising of the Afghans in Kabul, being the third British envoy thus slain in Kabul. The insurrection extended to Herat, which also fell into the hands of the war-party. Yakub Khan deplored the occurrence and expressed his hope of restoring order, but the English distrusted his sincerity. They began (Sept. 27th) a second advance upon Kabul, which Gen. Roberts entered Oct. 12th. On the 28th he hung five of the principal participants in the murder, all of them men of rank. Nov. 9th he placed Yakub Khan under arrest and sent him as a state prisoner to Peshawar. In the mean time, the Afghans rallied for the defence of their nationality, and although Gen. Roberts inflicted a severe repulse on them Dec. 14th, they continued to gather in great force around the capital. He therefore evacuated Kabul Dec. 17th, and withdrew his troops to the fortified camp of Sherpur. Here he was attacked from three sides Dec. 23d, but inflicted such a defeat that he was able to resume possession of Kabul and its castle, the Bala Hissar, Dec. 28th, while waiting for reinforcements. Quiet was restored and amnesty proclaimed Jan. 4, 1880, to all but the leaders of the insurrection. But the Ghilzai tribe and the other supporters of Yakub Khan's authority rallied at Ghazni, between Kabul and Kandahar, around the infant son of the deposed amir, under the leadership of Mohammed Jan, who proclaimed a holy war. The British forces from Kandahar marched upon their stronghold, and occupied it after one of the severest battles of the war, thus breaking the last organized resistance to their authority in Western Afghanistan. In a proclamation of Jan. 16, 1880, it was announced that the province of Kandahar was to be separated from the rest of the country and erected into an independent state under a waly (or prince) of its own; and, April 3d, Sher Ali was appointed to this office. This was no less offensive to the southern tribes than to the northern Afghans, from whom they were sundered.

The April elections in England transferred the English Government to the Liberals, who had denounced Lord Beaconsfield's attempt to secure "a scientific frontier" for India by the invasion of Afghanistan. It now remained to find a dignified mode of retiring from the country. Abd-ur-Rahman Khan (son of the eldest son of the amir Dost Mohammed), hitherto a Russian pensioner, offered himself early in May as an amir who would govern the country in accordance with British pretensions. He already had been accepted as amir in the province of Badakhshan. On the 27th the British offered him the amirship, and June 16th he advanced towards Kabul with the troops in his service. On the 22d of July a durbar was held at Kabul, in which he was recognized as amir by the English, and received promises of fealty from the chieftains and sirdars of the capital and its neighborhood, including the partisans of Yakub Khan. In the mean time, the English began the evacuation of Kabul.

While these arrangements were in progress the war-party under Ayub Khan, brother of Yakub Khan, were advancing from Herat upon Kandahar, in whose neighborhood they inflicted a total defeat upon the British forces under Gen. Burrow, July 26th. The British left 1350 of their number dead and wounded on the field, and fell back upon the city, which was in danger of capture. On Aug. 4th, Gen. Roberts left Kabul to come to their relief with 10,000 men; on the 30th he entered the city after a march of surprising speed and endurance; on the 1st of September he inflicted a decisive defeat on Ayub Khan, capturing all his cannon and dispersing his army. After this efforts were made in England to secure the retention of Kandahar as a place of military and commercial importance; but the Gladstone ministry refused to listen to the proposal, and yielded to the amir's urgency for the restoration of Kandahar to its former position as a part of Afghanistan. On the 16th of April, 1881, it was evacuated, and the troops of the amir entered. Soon after the complete evacuation of the country was effected.

Ayub Khan, having rallied his forces with Russian help, inflicted a defeat on the amir's troops at Kandahar July 27th, and took possession of the city. But Abd-ur-Rahman himself advanced upon the city with his army, utterly defeated the pretender, and Oct. 13th took Herat itself. Ayub Khan fled to Persia, and the war ended.

The "scientific frontier" secured to the English by the treaty of Gundamak was abandoned, and the amir reigns over a country of the same extent as that governed by his grandfather and his uncle. (R. E. T.)

See Vol. I. p. 219 Am. ed. (p. 245 Edin. ed.).

AFRICA. So great has been the progress of discovery in Africa during the decade ending with 1882, through the combined efforts of government expeditions, scientific parties, and private explorers, that there have been in that time more important additions made to our knowledge of the continent than in the whole course of any previous century. Equatorial Africa has been several times traversed from sea to sea; great water-basins have been discovered, and their positions accurately defined; important rivers have been traced from their sources to their mouths; and peoples dwelling in regions yielding products promising a rich commerce in the future have for the first time been made known to the world. These substantial facts have led to the formation of several bodies to promote the civilization of the entire continent by practical means, and the year 1883 marks the beginning of schemes of colonization which promise ere long to put the various tribes and peoples of the interior into peaceful communication with each other in order to further an equitable system of inter-trade.

Minor Explorers.—In glancing over the work accomplished in the last ten years by travellers of all nationalities the investigator is struck by the large number of aspirants for geographical standing who figure in the periodicals devoted to exploration. They start from all points of the compass well equipped, but from a variety of causes rarely penetrate beyond the safe trading-posts, and return telling little that should be recorded here. It suffices to mark those explorations which have had, and will continue to have, an important influence in determining the future of the continent.

Baker Pacha's Expedition.—Sir Samuel White Baker's expedition was equipped in 1869 by the khedive of Egypt, at the request of the prince of Wales, to suppress the slave-trade, and was the most important movement ever made in that direction. His firman, dated April 1, 1869, constituted him pacha and governor of Central Africa for four years. He was commanded to annex the countries he should visit; to introduce a system of regular commerce; to open to navigation the great lakes about the equator; to establish a chain of military stations and commercial dépôts at intervals of three days' march throughout Central Africa, with Gondokoro as the base of operations. To him was committed absolute power — even that of death — over all his followers. The expedition, provided with six steel steamers built in sections, 1600 native troops, including cavalry and artillery, mountain-howitzers, repeating rifles, and a vast assortment of goods for trading purposes, arrived at Khartoum in Jan., 1870. At the capital of the Soudan his endeavor to suppress the slave-trade was met with every form of open and secret hostility, and was regarded with the greater disfavor as this province was to bear the main burden of the expenses, which were very large. Baker and his force started for Gondokoro

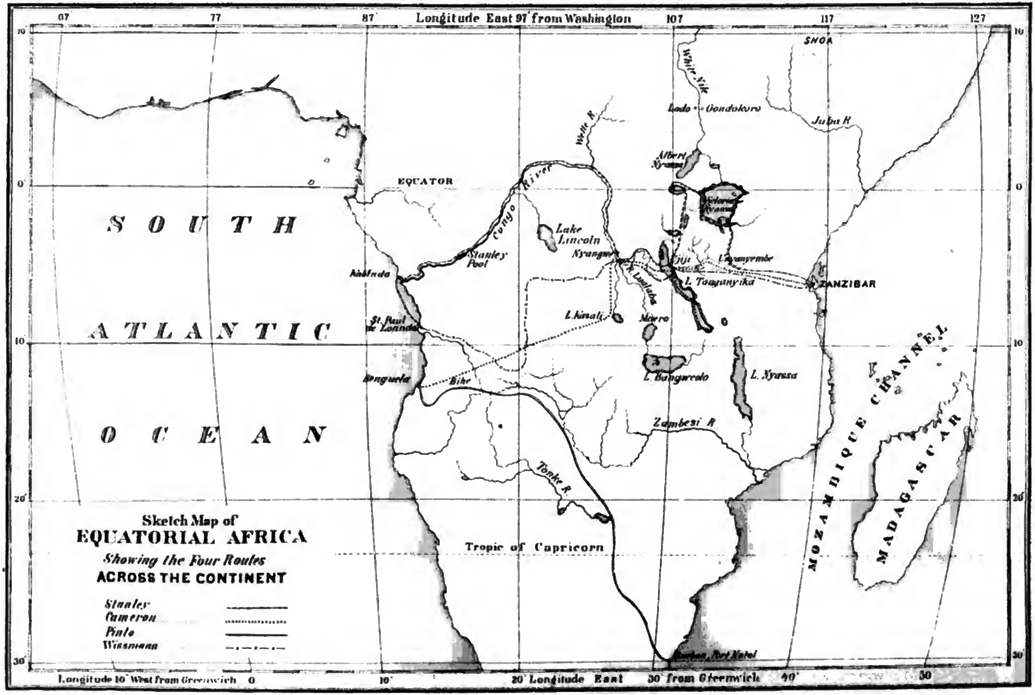
Feb. 8, 1870, with a fleet of transports, ascending the White Nile. On reaching the Bahr Giraffe, he found the channel lost in the drifting vegetation, or *sudd*. His progress through these natural obstructions was very slow. A channel had to be cut through the dense mass with sharpened swords. The men were beset by every species of tropical insect, and elephants, lions, hippopotami, and crocodiles were among the dangers threatening them in these "horrible treeless swamps infested with mosquitoes." The mortality among the men was large, and it was feared, while his transports were confined to these malaria-breeding shallows, that the grand enterprise might entirely fail before reaching the ultimate base of operations. For days progress was made only some hundreds of yards through the *sudd*. Many of the vessels were laden with heavy machinery, sectional steamers, and the supplies necessary to nourish the command. Slave-traders were encountered on this portion of the journey, and Sir Samuel Baker began to exercise his sweeping authority as viceroy of the region in an exemplary and salutary manner. He detected the governor of Faschoda in his own camp in the act of kidnapping a large number of slaves, the latter suffering the most brutal treatment. Baker's description of this horror is a fair sample of his experiences during the years he governed the equatorial territory. He says: "Many of the women were secured to each other by ropes passed from neck to neck. A crowd of young children, including infants, squatted among the mass, and kept a profound silence, and regarded me with profound curiosity. Having sent for my note-book, I divided the slaves into classes, and counted them as follows: 'Concealed in boats we have discovered, 71; those on shore, guarded by sentries, 84; total, 155, including 65 girls and women, 80 children, and 10 men.' The governor of Faschoda, whom I had thus detected in this act of kidnapping, was the person who a few weeks before had assured me that the slave-trade was suppressed and that the traders could not pass his station at Faschoda. The real fact was, that this excellent example of the Soudan made a considerable fortune by levying a toll upon every slave that the traders' boats brought down the river; this he put into his own pocket." After remaining two months in the Nile obstructions, the channel of the White Nile was at last discovered, but it was found necessary to build a dam to float the fleet again in navigable waters. The entire force was put to work constructing fascines for this purpose. Corn-sacks filled with sand were likewise employed in building the barrier, even while the working-parties, the small boats, and the transports were attacked by furious hippopotami. Meanwhile, scurvy and dysentery broke out among the troops. This part of the now celebrated attempt of Sir Samuel Baker to carry civilization to the heart of the continent is, in all of its aspects, one of the most graphic and unique chapters in travel ever written, and is fully detailed in his *Ismaïlia* (1875). Every kind of African game was visible—from herds of elephants numbering as high as seventy, to lions and antelopes and numerous species of birds. The dam proved a complete success, and the fleet finally arrived at Gondokoro, April 15, 1870, a distance of 1409 miles from Khartoum, having sailed through what had every appearance of being an abandoned country. They received a morose greeting from the natives. Baker's next important step was to annex the country in the name of the khedive. This he did with appropriate ceremonies, issuing a proclamation to his followers that no person should cut or in other ways destroy any tamarind or oil tree under any pretext whatever, nor should any tree whatsoever be damaged within a distance of 2000 paces from the camp. No person should trade in ivory or accept ivory as a present or in exchange; neither should any person shoot elephants or cause them to be shot, all ivory being the property of His Highness the khedive. No person should purchase or receive slaves as presents or in exchange. Offences against this code were punishable at the will of Baker Pacha. He soon became involved in troubles with the warlike Bari, this tribe having refused submission, and a declaration of war ensued, in which Baker specially forbade the capture of women or children of either sex, "and any officer or soldier disobeying this order will suffer death." Open war commenced on June 4th, and hostile encounters became frequent. A few days afterwards there appeared Abou Saood, the greatest slave-trader of Central Africa and a representative of the house of Agad & Co., situated at Khartoum. From first to last, Baker regarded him as a scoundrel, and the narrative shows that this cunning trader, with a large force at his back, did all in his power to thwart the purposes of the expedition. Baker's subsequent operations in the vicinity of Gondokoro were full of danger to himself, Lady Baker, and the command. He lost many men from ravenous crocodiles. The Bari continually harassed the camp and killed his sentries, nearly every night devising some new method of sudden and wily attack. Baker was compelled to build a fort to protect his position, and set out upon a regular campaign against the Bari; but finally, after varying vicissitudes, he conquered the stubborn tribe and accustomed his Egyptian soldiers to the tactics of these cunning barbarian warriors. During its progress he captured abundant supplies. But the British commander found that his greatest difficulty was among his own officers and men, who could not understand why, as Mohammedans, they should not be permitted to capture women and children as lawful prizes of warfare. This gave rise to great disaffection, which continued throughout his stay in Central Africa. The soldiers, Egyptian and black, likewise chafed under the stringent discipline enforced by a Christian commander, and Baker denounces their conduct as disgraceful. "I have seen them," he says, "in the presence of the enemy rush into a village and commence indiscriminate pillage, the officers mingled with the men in a race for plunder." Baker was soon confronted with an organized mutiny led by his next subordinate, Raouf Bey, who announced his intention to abandon the expedition and return to Khartoum with his fellow-conspirators. Baker met the situation promptly by ordering an advance into the enemy's country, and made a descent on a cluster of villages in the Regiāf country, where he found plenty of corn for his already half-starved command. In Nov., 1871, Baker's available force was reduced from 1600 to a little over 600 by despatching to Khartoum wounded soldiers and sailors, women and children, numbering 1000 souls. Abou Saood had gained his point, and the expedition was paralyzed. Baker soon afterwards took up his march into the south-eastern country, advancing to Loborè through a beautiful and picturesque country. Here he believes a great commercial city will be built, and will become the capital of Central Africa, which will be developed by commerce on the equatorial lakes, employing steamers. In March, 1872, he arrived at Fatiko, where he again encountered the persistent cunning, opposition, and treachery of Abou Saood. Here Baker gave to the natives a semblance of a government, and punished those who acted contrary to his authority. On the 25th of April, Baker and his command reached the capital of Unyoro, the town of Masindi. He immediately sought the king, Kabba Rega, "an unmannerly young lout," whom he found suspicious and wary. Soon afterward Baker made him presents of great variety in exchange for ivory, which the king was in the habit of sending to M'T'esé, the powerful king of Uganda, on the Victoria Nyanza, and which ultimately found its way to Zanzibar. While at Masindi the most notable event of the expedition occurred. The natives suddenly rose and made a fierce attack upon Baker's men, who narrowly escaped being utterly annihilated. The Egyptian troops finally won the day, and Masindi was completely destroyed. In this engagement Baker's devoted personal attaché, Monsoor, and other valuable men were slain. After a severe fighting march, Baker and his command arrived at Foweera, on the Victoria Nile, only to find everything destroyed by fire. It was here that Baker learned that an attempt had been made, through the machinations of Abou Saood, to poison him and his men, and that this villain had actually planned the attack at Masindi. Baker's further stay in Central Africa was marked by numerous and dramatic incidents, but throughout his supremacy he was stern in his authority, frequently making use of flogging as a wholesome discipline; and on Jan. 1, 1873, he was able to say, "Thank God, we find peace in the country, with every prospect of prosperity!" He soon afterward started on his return voyage, and reached Khartoum June 29, 1873, and immediately set out for Cairo, where he received numerous marks of honor from the khedive. The results of the expedition were of immediate and great importance to the future of Central Africa. Abou Saood was subsequently removed to Cairo in chains, and although he was afterwards released, Baker's successor, Col. Gordon, was able to counteract his malign power in the equatorial region. The geographical results were the accurate survey of the region by Lieut. Julian Baker, R. N., and the statement of Sir Samuel that Lake Tanganyika is connected with the Albert Nyanza by a channel. Geographers, however, have not yet accepted this as the fact. The occupation of the equatorial provinces was continued by the khedive, who appointed Col. Gordon to the command.

Lieut. Cameron's Expedition.—Lieut. Verney L. Cameron's expedition was fitted out at the expense of the Royal Geographical Society, and had for its object a further exploration of that region in which Dr. Livingstone had spent twenty years of his life. Cameron arrived at Zanzibar in January, 1873, accompanied by Dr. Dillon, his former messmate in the royal navy. The object of his mission was announced to be to abolish the slave-trade and cross Africa from sea to sea. His outfit and followers in leaving Bagamoya were not of a character to give assurance that he would ever perform the feat of crossing the continent. He had thirty men as soldiers, servants, and donkey-riders, and a few more were engaged as porters. In February the party struck inland, and reached Kikoka without notable incident. Cameron was at times on the regular caravan-route to Ujiji, distant about 900 miles from the coast. He pushed on, losing men by death and desertion, and suffering the usual drawbacks incident to this region, until he arrived at Unyanyembe in August, 1873. Towards the end of that month the expedition was nearly broken up, owing to a mutiny among the Askari whom Cameron had employed at Zanzibar. But the disturbance was promptly quelled. Fever and desertion now played havoc with his sparse following, and Bombay, the celebrated native of Zanzibar who had been with Speke and Grant, and was subsequently with Stanley, was generally drunk. Lieut. Cameron himself suffered terribly with the fever, becoming blind and helpless. It was at this time that the commander received a letter from Jacob Wainwright, Livingstone's body-servant, announcing the death of Dr. Livingstone. Shortly afterward Cameron lost his best friend and associate, Dillon, who succumbed to the climate. On the 18th of February following he sighted the shores of Tanganyika, nearly sixteen years after the discovery of the lake by Burton. Recuperating at Ujiji, Cameron, with additional men and supplies, made a brief descent of the coast, crossed Tanganyika Lake in latitude 5° 30′ south, and set out on his important journey across the continent—a feat not then performed in these low latitudes. Before reaching the western shore he saw many gorillas, but was unable to shoot them. In his narrative he gives excellent descriptions of the native peculiarities and of the country he traversed. Arriving at Ruanda, to the westward of Lake Tanganyika, in May, 1874, he found it to be a considerable town, the capital of Waguhna. It is situated on a fertile plain, alluvial in character, extending from the mountains of Ugoma to the river Lukuga, intersected by smaller streams flowing into Lake Tanganyika. At this point the thermometer registered 131° in the shade, and the march through "stinking, fetid mud" was most trying. The advance was likewise hampered by the nervous prostration of the men, who had indulged in excessive drinking at Ujiji—a custom fatal in the equatorial regions. Mékáto was the next important settlement reached. This town lies in a broad, deep valley drained by the Kaça, an affluent of Lukuga, the prospect being very beautiful. There were many fields of matama and cassava, contrasting with the sun-dried grass; tiny hamlets of thatched huts clustering at the feet of groves of pine trees, with wreaths of pale blue smoke curling up from the fires, and in the foreground a line of heavy vegetation along the Kaça. Cameron then pushed on to Kwamrora-Kasea, five marches off. The route lay through a rich country watered by numerous streams. Some of them were so wide and deep that it was necessary to throw a rope of creepers across to prevent their being swept away. These streams were particularly beautiful, especially the Lugungwa a short way below the ford, where it had a channel fully fifty feet deep in the soft sandstone. The hills along which the party marched now joined the Ugomo, having hitherto been separated by the valley of the Lugumba. Tracks of all kinds of large game except those of giraffes were very numerous. Buffalo were abundant. Along this region the mpatu tree flourishes; it is often 30 feet in circumference and rises to 100 feet before spreading its branches. Here native perfumed oil is obtained from this tree, and the trunk is used in manufacturing native implements and idols for fetich-worship. To Pakhûndi the road lay across a fairly level country, partly jungle and partly clearing, and over one sandy plain with many palms. On the 22d of June, Cameron advanced through a hilly and diversified country watered by a few streams—some working to the Rubemba, about twenty miles to the northward, and others flowing away to the Lukuga—arriving at Kwaséré. At this settlement were three small foundries, showing proficiency in the mechanic arts. Passing on through Uhiya, Cameron found the people different from their neighbors in habit. Their practice of chipping all their teeth to points gives them the appearance of wild beasts, and their head-dresses are curious and hideous. Tattooing is common among both sexes: crescents, Maltese crosses, and a trelliswork of deep cuts over the body are the favorite marks. Crossing the Luwika, Cameron found it a considerable stream, falling into the Lukuga, which had been traced to its confluence with the Lualaba. Marching westward, he passed through a well-watered valley, and then began the ascent of the mountains of Bamberré. He camped at Koana Mina, looking down into enormous gullies and ravines, where sunlight never falls and breezes never stir. Trees festooned with magnificent creepers, and rising from the depths to a height of 300 feet, are among the sights in this strange land. Reaching the Mayuéma people at Moéné Bugga, he found them the most prolific people in Africa, and endowed with many good qualities, "although the most filthy cannibals." Not only do they eat the bodies of enemies slain in battle, but also of people who die of disease. They prepare the corpses by leaving them in running water until they are nearly putrid, and then devour them without cooking. They also eat all sorts of carrion, and their odor is very foul and revolting. The explorer reached the Luama, an important affluent of the Lualaba, in July. This river rises in the mountains skirting the western shores of Tanganyika. It is navigable for steam-launches. Cameron found all the streams in this region full of hippopotami. Immense forest-fires, producing rainfalls, were also a marked feature. In crossing the Lulindi (July 18), it was necessary to hang a cleverly constructed suspension bridge. Four large cables of creepers were fastened to the trunks of trees—one pair about four feet higher than the other—and to these were secured other creepers from the tops of the loftiest trees on each side of the stream, while horizontal guys prevented the bridge from swaying. Sticks were laid across the lower pair of cables to form a roadway. The structure when finished was novel and effective, and formed a new expedient in African travel. The command was now well on its way towards Nyangwé, threatened sometimes by the natives, owing to the abuses of Arab traders. Hills yielding iron ore were passed. Cameron did not wait for his command to march to Nyangwé, but, launching his boat on the Lualaba, arrived at Nyangwé in August, 1874, his expedition arriving afterwards. This point has been chosen by the Zanzibar traders as a permanent settlement on the Lualaba. Here Dr. Livingstone had resided during his explorations first made known by Mr. Stanley. Cameron also found that the Lualaba to the westward of Nyangwé received three large rivers from the northward—the Lilwa, Lindi, and Lowa. The last he believed to be the Welle of Dr. Schweinfurth, because it was reported to be as large as the Lualaba at Nyangwé, and to be fed by two important affluents—one from the east, the other from the west. The levels Cameron obtained at Nyangwé conclusively proved that the Lualaba could have no connection whatever with the Nile system, the river at Nyangwé being lower than the Nile at Gondokoro. "The volume of water passing Nyangwé in the dry season is five times that passing Gondokoro on the Nile." This great stream (the Lualaba), says Cameron, must be one of the headwaters of the Congo. Stanley afterwards completely proved the truth of this assertion, and showed that Livingstone, who had died believing himself the discoverer of the true sources of the Nile, had really spent the latter years of his life in exploring the headwaters of the Congo. In Cameron's map of his explorations he traces the trend of the Congo, but he does not permit his imaginary river to go northward beyond 4° 30′ south latitude; while Stanley, who continuously followed the stream, discovered that it took a grand sweep to the northward, reaching a point as high as 2° north latitude. It was at Nyangwé that Cameron found that there was a large lake, called Sankorra, bisected by the 22d meridian of east longitude, lying in great part north of 5° south latitude. Stanley fixes this lake nearly in the same position, and supposes it is Lake Lincoln, so named by Dr. Livingstone. Cameron, however, believes the Lake Lincoln of Livingstone to be Lake Iki, connected with the Lualaba by the affluent Lomané, thus leaving this important point in dispute, with the probabilities in Stanley's favor. On August 26th, Cameron started for Tipo-tipo in a direction almost due south, marching overland. He continued to have a great variety of adventures and to encounter many hardships on this branch of his almost direct southern journey to Lake Kassali, about 300 miles from Nyangwé. Before reaching the lake he passed through Warua, inhabited by a people of singular barbaric customs. The king and others high in authority inflict punishment by death or mutilation. A nose, finger, lip, or ear may be cut off for mere peccadilloes, while for serious offences the hands, ears, toes, and nose are all taken. Their religion is a mixture of fetichism and idolatry. On Nov. 22d the party arrived at Kowedi, on the banks of the Loroe. Here Lake Kassali, containing floating islands inhabited by people, was sighted, but Cameron was not permitted to sail upon its waters. Lions on friendly terms with villagers, deadly trees like the upas, and underground dwellings with rivulets flowing through them, were some of the marvels recounted to the Englishman by natives of apparent credibility as belonging to this region. Passing through Ulunda in July, 1875, the command witnessed all the horrors of the slave-trade. September found the party at Kalendi, marching in good time towards the Atlantic Ocean. Farther on, Cameron was obliged to sell his shirts for food. In November, 1875, the explorers crossed the Kukewi River, and their route lay through a range of mountains, with villages perched upon their summits, in longitude 15° east. They now began to meet caravans hourly. The last few days were accompanied by great suffering and well-nigh starvation. Cameron thus describes his approach to Katombéla on the coast: "I was almost beside myself with very joy, and the men, carried away with the same sense of relief, joined in the running till we approached nearer the town." Thus ended an expedition which, as Sir Henry Rawlinson has well said, "has produced that series of important results which have made Lieut. Cameron's expedition memorable in the annals of geographical science."

Lieut. Cameron was the first man to cross equatorial Africa. The direct geographical result of his travels, besides those already mentioned, was that he discovered another great water-system, composed of a stream flowing through a series of lakes intermediate between the Lomané and the more easterly valley which Livingstone had followed up from Lakes Bangweolo and Moero. This new river Cameron believes to be the true Lualaba, although many future surveys must be made before this great lake-region of equatorial Africa can be accurately mapped. On his return to England, Lieut. Cameron received congratulations from almost every country in Europe on his splendid journey, and the gold medal from the Royal Geographical Society, the patron and supporter of his work. His volume, *Across Africa*, was published in 1876.

Stanley's Expedition across Africa.—The expedition of Henry M. Stanley from Zanzibar to the mouth of the Congo on the Atlantic Ocean is now generally regarded as the greatest feat of exploration performed in modern times. He left England Aug. 15, 1874, on a joint mission for the *New York Herald* and the *London Daily Telegraph*, to complete the discoveries of Dr. Livingstone, left unfinished by the death of that veteran explorer at Lake Bemba in the spring of 1873. Stanley's equipment was chosen without regard to cost, and embraced every variety of material necessary in the region he was about to visit, including a sectional boat of his own conception, the different parts of which might be borne on the shoulders of porters. Two Englishmen and an American accompanied him, and he completed his remarkable journey in two years eight months and twenty days. Stanley arrived at Zanzibar to begin this work on Sept. 21, 1874. In organizing his force at this port the explorer selected the chief men who had been engaged by him in his search-expedition after Livingstone in 1872. His outfit included goods, cloth, beads, wire, stores, medicine, bedding, ammunition, boat, oars, rudder and thwart, instruments and stationery, photographic apparatus, dry plates, and miscellaneous articles too numerous to mention. It weighed a little over 18,000 pounds, and, being divided into loads weighing 60 pounds each, required the carrying capacity of 300 men. His contracts with his men provided not only that he should be responsible to them pecuniarily, but also that he should be kind and patient, treat them medicinally in cases of sickness, and act as arbiter in all cases of dispute. On Jan. 18, 1875, he camped near the loftiest altitude, 5400 feet above the sea, finding tiny rivulets west of Suna and Chiwyu, which, as he continued his journey to the north-west, gradually converged into one main stream trending towards Lake Victoria. It is in this region that Stanley claims to have discovered the extreme southern source of the Nile. Up to this time his drinking-water had been obtained from pools or shallow depressions lately filled by rain. Between Suna and Chiwyu he crossed one small rill, flowing north-easterly, which soon afterwards joins another and another, gathering volume and changing its direction to the north-west. These are the farthest springs and head-waters of a river that will presently become known as the Leewambu, then as the Monangah, and lastly as the Shimeeyu, under which name it enters the Victoria Lake on the south-east coast of Speke Gulf. This river,

AFRICA.


Longitude East 97° from Washington
67°
77
87°
107
117
127
10
0°
10
20°
30°
SHOA
White Nile
Lado
Gondokoro
Juba R.
Welle R.
Albert Nyanza
Victoria Nyanza
EQUATOR
SOUTH
ATLANTIC
OCEAN
Congo
River
Lake Lincoln
Stanley Pool
Nyangwe
Kabinda
R. Lualaba
Ujiji
Unyanyembe
L. Tanganyika
ZANZIBAR
L. Kinali
Moero
St. Paul de Loanda
L. Bangweolo
L. Nyassa
Benguela
Bihe
Zambesi R.
Tonke R.
MOZAMBIQUE CHANNEL
MADAGASCAR
Tropic of Capricorn
Sketch Map of
EQUATORIAL AFRICA
Showing the Four Routes
ACROSS THE CONTINENT
Stanley
Cameron
Pinto
Wissmann
Durban, Port Natal
Longitude 10° West from Greenwich 0
10°
20° Longitude East
30° from Greenwich
40°
50

Stanley claims, is the "true source of the Nile." On March 8th, Stanley arrived at the Victoria Lake, and with his boat, the Lady Alice, began coasting along the southern shore of Speke Gulf. From the mouth of the Shimeeyu he passed the countries of Mazamza and Manusoa, and on this journey he reached the northern shore, having passed in view of Ukerewé. He afterwards sailed along the south coast of Ukerewé, arriving at the rocky islands of Kiregi, at present uninhabited. Stanley finally coasted along the Uganda shore. Of this part of his journey he says: "From the time the voyager touches Uganda ground he is as safe and free from care as though he were in the most civilized state in Europe. He and his are in the hands of M'T'esé, emperor of Uganda." April 25th found him at Kagya, where a plateau begins rising to the height of 1000 to 1500 feet above the lake. The plateau-cliff rises boldly and perpendicularly except in the folds or bends of the plateau-wall, where there is generally a gentle slope covered with banana and plantain trees. The natives entertain a strong dislike to strangers, but to those from Uganda they manage to show cold and grudging hospitality. Several days later he arrived at Bumbireh Island, where he found the natives unscrupulous robbers, cunning and audacious. They number 4000. While at M'T'esé's court Stanley met Col. Lenant de Bellfonds, a member of the Gordon Pacha expedition, who had come from Gondokoro on a mission to the king. Stanley was thus enabled to send despatches to the journals he represented by Col. Bellfonds, who safely delivered them at Gondokoro. Upon a subsequent mission Bellfonds was killed, with thirty of his soldiers, by the warlike Bari. Near the close of April, Stanley had a sharp encounter with the natives of Bumbireh. He endeavored to effect a landing on the island for purposes of barter, and the cunning natives inveigled him on until his boat reached the shore, when they seized the craft and landed it high and dry. Three hundred warriors soon opened upon the frail craft with stones and arrows when Stanley sought to launch the Lady Alice again, and he and his men barely escaped with their lives. As soon as possible he opened fire upon the warriors, killing many. This did not deter them from pursuit in canoes, two of which Stanley sunk by heavy broadsides from his most effective weapons. Hardly had they escaped from this exciting ordeal before the boat was attacked by two furious hippopotami, but Stanley's well-directed shots disabled these saurian monsters. Upon his return to camp Stanley found, to his sorrow, that he had lost his only American comrade, Frederick Barker, who had died twelve days before. Other and startling acts of treachery on the part of the people of Bumbireh followed. Stanley's allies, the Waganda, had been betrayed into ambush and a number of them killed and wounded. Policy and justice alike impelled the American to administer condign punishment. Having organized his force of attack in canoes, he found the enemy awaiting his arrival and massed in great force, numbering 3000. Anchoring within 100 yards of the shore, Stanley demanded if they would have peace. The answer being "No!" he opened fire with disastrous effect. The savages rushed into the water to attack, having only spears and stones for weapons. They were soon defeated with considerable loss by the explorer, whose renown as a military chief was carried far and wide among the equatorial tribes of Central Africa. Stanley now returned to the king of Uganda's court, and not the least of his achievements was to convert M'T'esé to Christianity. Continual wars between the native tribes were going on during Stanley's stay in this region of Central Africa. His entire journey from Zanzibar up to the time of leaving Uganda in Oct., 1875, had covered 1970 miles. He had traced the extreme southern sources of the Nile from the marshy plains and uplands where they arose to the great Nile reservoir, the Victoria Nyanza. He had circumnavigated the entire expanse; had penetrated every inlet and creek; had been five times engaged in savage war; had travelled hundreds of miles on foot northward of the Victorian Sea; and had explored with a large force the strange countries lying between the two lakes Muta Nzigé and Victoria. He had then returned and had struck south from the Katonga lagoon down to the Alexandra Nile, the principal affluent of the Victoria Lake, which drains nearly all the waters from the west and south-west. He then turned toward Tanganyika.

In this portion of his remarkable journey Stanley in every way confirms Speke, and awards to him the honor of having discovered the greatest inland sea of Africa. Stanley reached Lake Tanganyika May 27, 1876, camping at Ujiji, where he had first met David Livingstone in 1871. The second portion of Stanley's journey across the continent properly begins with his arrival at Nyangwé, the farthest northern point attained by Livingstone and Cameron. Thither he carried with him his boat, the Lady Alice, in sections, reaching there in November, 1876, after a journey of 350 miles in forty days, itself a remarkable geographical feat. Nyangwé, which he ascertained by observation to be in 4° 15′ south latitude and 26° 5′ east longitude, is situated on the Lualaba of Livingstone, the river there having a width of two miles in the rainy season, with a volume of 240,000 cubic feet of water a second. He learned on his arrival that Cameron had been there, and, being unable to follow the Lualaba in its northerly course, had started southward towards the Atlantic coast. Stanley did not believe, with Livingstone, that the Lualaba belonged to the Nile system, but thought, with Cameron, that it was the eastern branch of the Congo. Stanley now had ample force to do what had been impracticable for Livingstone and Cameron; and, besides, he had the moral support of an iron will. He met with the same difficulty which hampered his predecessors in the unwillingness of the natives to supply his people with canoes. They told him, as they had told Livingstone and Cameron, that the tribes dwelling to the north on the Lualaba were fierce and warlike cannibals, who would permit no one to enter their territory, as the Arab traders had frequently found to their cost; that between Nyangwé and the cannibal region the natives were treacherous; and that the river ran through dreadful forests, through which he would have to hew his way,—information which afterwards proved to be true. But Stanley would go, nevertheless; yet this part of his work was not an easy task, as the people of Nyangwé filled his followers with terror by the accounts they gave of ferocious cannibals, the dwarfs with poisoned arrows who dwelt near the river, and the terrible character of the forests through which they would be obliged to pass. Stanley finally obtained the canoes and enlarged his force. His theory of the flow of the river was also correct, and Cameron's wrong, the latter believing that it flowed almost due west into the Atlantic Ocean. Stanley wrote at this time: "I am determined to stick to the Lualaba, fair or foul, fortune or misfortune. I have supplies for six months. Beyond that, Heaven knows what will become of us if we should find the Lualaba running into some unknown river, without a bead or cowrie to buy food." The first three weeks were disheartening, confirming all they had heard of the difficulty of passing northward along the river—so much so that they had to abandon it and make their way through dense and gloomy forests, which created great dissatisfaction among his followers. Their disposition to abandon the expedition became general, and he resolved to try the river; and after much argument, deliberation, and persuasion his decision was acceded to, and they reached it at a point 3° 33′ south latitude, being 41 geographical miles north of Nyangwé. Here his little vessel, the Lady Alice, was put together. Stanley says at this point: "I formed again the resolution never to abandon the Lualaba until I learned its destination." He made an encouraging speech to his men, telling them they had promised to follow him at Zanzibar for three years, and that one year was yet unexpired. "I will not," he said, "leave this river until I reach the sea, and I promise you that we shall reach it before the year is out. All I ask you is to follow me in the name of God."—"In the name of God, master, we will follow you," was their reply. His first attempt to navigate the river verified what they had heard of the treacherous character of the natives. They invited the white men to blood-brotherhood, and after Pocock, Stanley's associate, had gone to an island with ten men to undergo this rite, Stanley discovered that the intentions of the natives were hostile, finding thirty armed canoes proceeding in the direction of the island and sounding the war-cry. He was enabled, however, by a sharp and timely movement, to reach the island and rescue Pocock and get safely down the river, as his force of 500 men, armed as they were, was too powerful for the enemy. They now passed along the river in two divisions—one by land along the left bank, and one by the stream. The land party was vigorously attacked, but succeeded in defending themselves until the water division approached, when the natives retired. They now reached that part of the stream obstructed by a long series of cataracts, which Stanley calls the Falls of Ullassa. Here their progress was again disputed by a body of armed natives, but they succeeded in passing down the river without loss. As they continued to descend they were constantly met with hostile demonstrations and attacks, all of which Stanley repelled with great gallantry. All their attempts at friendly intercourse were received by showers of poisoned arrows, and the land party was again attacked. To add to Stanley's trials, the small-pox broke out among his escort, and in three days eighteen men died; others of the party were attacked with dysentery, and ulcers appeared on the limbs of many as the consequence of severe marching. At 125 miles from Nyangwé their boats were floating hospitals. Seventy-two died of the small-pox alone, and while thus afflicted they were repeatedly attacked by the savages for two days and two nights, both by land and by water, the whole country being up in arms against them. So constant were these attacks that they could not bury their dead or succor those who had been wounded by poisoned arrows and had become delirious from the poison. Having passed this peril, their Arab escort resolved to leave them, and Stanley feared that his own followers would also desert him; but they stood by him in this critical moment. Stanley's force now consisted of 146 persons, and the departure of the Arab escort was a sore trial. When his people heard the farewell song of the escort as it came "in wild and weird-like tones over the water," they wept as though their hearts would break. "It was," says Stanley, "the saddest day I ever spent in Africa."

In January, 1877, they approached a long series of cataracts, or rather falls, and entered the dreaded cannibal regions. Here they were hunted night and day like game, and four times were obliged to break through the lines of hostile canoes brought together to obstruct their passage down the river; they continued to be the object of these incessant attacks until they reached Basna Falls, 0° 30′ south latitude. Return was now impossible; they would be unable to pull their vessels against the stream. For twenty-four days they had to repel these assaults. In going a distance of 42 miles they were obliged to go around six falls, to drag their canoes 30 miles by land, and to cut a track 13 miles through a dense forest, in order to transport the Lady Alice around the cataracts. Then they had a period of rest. Between the 24th and 25th parallels of north latitude they came to a noble tributary 2000 feet in width, which Stanley thinks is the Welle of Schweinfurth. As they approached the mouth of this river they were suddenly attacked by fifty-four canoes. They were surrounded by the natives in a second, but after hard fighting Stanley drove them back. The great river, now taking a south-westerly direction, had here a width of from two to ten miles. Their next peril was starvation. They had been three days without food, and no communication could be established with the shore. At last Stanley took a great risk and invaded a village, finding the natives, much to his surprise, friendly. He asked them the name of the river, as they had had intercourse with the Atlantic coast. They answered Yakuta-ya-Kongo. The great problem was solved; the Lualaba of Livingstone and the Congo were one and the same river. They were yet 850 miles from the coast and 900 miles from Nyangwé. Farther down the river they were again attacked, by fifty-four canoes armed with muskets. The nineteen canoes of Stanley, after a running fight of twelve miles down the river, won the day. This was the thirty-second battle since starting on the Lualaba. At a distance of 1480 miles down stream the river became straight and narrow, and a succession of cataracts and whirlpools marked its course. Pocock and ten men were lost at one of these cataracts, and Stanley with the Lady Alice barely escaped. Then they came near being starved. Finally, Stanley reached the coast in August, 1877, having passed fifty-seven cataracts and travelled along the Congo 1800 miles. Of the 350 men with whom he left Zanzibar in 1874, but 115 reached the Atlantic coast alive. Thus triumphantly ended a geographical feat which has brought to its chief a renown unequalled in ancient or modern times in the copious annals of discovery.

Col. Gordon in the Equatorial Regions.—Lieut.-Col. Charles George Gordon, C. B., known to his contemporaries as "Chinese" Gordon, and a gallant officer of the British army, succeeded Sir Samuel Baker as governor of the equatorial provinces. His career in this capacity is pertinent as showing valuable discoveries made by his subordinates in the Nile basin and outlying territory. He reached Khartoum in March, 1874. On ascending the White Nile he found the same obstruction, the vegetable *sudd*, which had arrested the advance of his predecessor. This *sudd* is formed, Gordon asserts, by the growth of an aquatic plant which flourishes on the banks of the equatorial lakes, with roots extending five or six feet under water. The natives burn the top parts dry. The ashes form mould, and fresh grasses grow until it becomes like *terra firma*. When the river rises these masses float down the Nile until they come to a curve, where they stop. More and more of these floating islands drift down, till at last the river is blocked up. Though the water flows under them, navigation is prevented, as they bridge the river for miles, diverting its channel. It required large forces of men and two steamers to clear out the *sudd*. At last, when this vegetable dam was nearly ready to break, the men were surprised by the barrier giving way, sweeping down on the vessels, dragging the steamers down some four miles, and clearing the passage. The scene was terrible. The hippopotami were carried down screaming and snorting; crocodiles were whirled around, and the river was covered with dead and dying hippopotami, crocodiles, and large fish that were carried down by the mass. This was a great piece of good fortune for Gordon. While it formerly took over a year to reach Gondokoro, Gordon was able to reach this settlement in twenty-one days by steamer. After his arrival near the Nile basin, Gordon and his subordinates, Americans, Italians, and Belgians, solved several important geographical problems. He also set to work to complete the humane work left unfinished by Baker, and dealt blow after blow to the slave-traders. Among his subordinates were Gessi, an Italian, and Col. Long, Purdy Bey, and Col. Mason, all Americans. Col. Long was charged with a mission to M'Tesé, king of Uganda, which country, after hard fighting, he visited with considerable results, finding a lake delivering into the Victoria Nile, which Long asserts is a major source of the great river. This sheet of water, which intelligent explorers believe was only the parent river in a swollen condition, Long has called Lake Ibrahim, to honor the dynasty of Mehemet Ali. Geographers have generally denied him the honor of such a discovery as he claims to have made. Col. Mason later circumnavigated Lake Tanganyika, while other officers visited and annexed the outlying country. To Purdy Bey, since deceased, is due the credit of subduing the kingdom of Darfour, which had long been an isolated country, inflicting the penalty of death on all travellers. Its blind sovereign, Hussein, who during his reign had murdered many Europeans and Egyptians, was borne captive to Cairo, and the Egyptian dominion was thus largely extended toward the Atlantic Ocean. After travelling a total length of 8490 miles in three years, Gordon returned to England in 1879, to take service in civil employment in India.

Serpa Pinto's Journey across Africa.—The journey of Serpa Pinto across Africa from Benguella to Natal, leaving the former point on the Atlantic coast Nov. 12, 1877, and reaching Natal seventeen months later, marks the renewed activity of the Portuguese in this part of Africa. The Portuguese had long been enterprising traders and explorers on this continent. In 1876 a geographical society was founded in Lisbon, simultaneously with a "Permanent Commission of African Exploration," to renew the Portuguese enterprise in Africa, which had been degraded by slave-traders who were subjects of the king. The national interest being aroused, Major Serpa Pinto volunteered to become the pioneer of the new era, and successfully bore his sovereign's flag from coast to coast. Accompanied by two of his countrymen, Lieuts. Capello and Ivens of the Portuguese navy, and fifty porters, the explorer started for Bihé. They left the beautiful valley of the Dombe Grande in December, and passed through a desert to Quillengues. Leaving this town in January, 1878, they met the naturalist José d'Anchieta at Caconda. There the real trouble began. Pinto's two officers left him, to meet him again among the orange-groves of Belmonte, and then fade out of sight. The twenty days before reaching Bihé were days of profound anxiety, fraught with danger, prospects of mutiny among the carriers, and the petty intrigues and rascalities of his own countrymen, "expatriated wretches" settled along the route, who did their best to bring about an utter collapse of the expedition. Before reaching Bihé, sickness and fever overcame the leader, and after several days of unconsciousness he found himself in Silva Porto's station at Belmonte in the Bihé. On June 14th he broke up his camp at Belmonte, and began his journey through a virgin country, hitherto only vaguely known from oral descriptions of Portuguese traders, and never before delineated on any map. This region to Lialui is reached on the upper Zambesi, and his explorations there form the most important work of the expedition. In spite of sickness, hostile attacks, and innumerable difficulties, the explorer kept a detailed geographical journal, took astronomical and hypsometrical observations at all important points, and thus laid down the exact topography of the country he traversed, including for the first time the true courses of the upper tributaries of the Zambesi. Eastward of Bihé is the unexplored land of the Quimbandes, watered by some of the head-streams of the Cuanza River. These people are a clan of the great Ganguella family, a lazy and useless race with a Jewish physiognomy. East of the Quimbandes are found the Luchazes, of the same family. In their country Pinto made the ascent of a lofty mountain 5298 feet above the sea-level, from which he enjoyed a magnificent panorama, exhibiting in full view the entire course of the river Cuango, with the water-sheds of the Cuito, Cuime, and Cuiba. From the Luchaze country the route lay towards the south-east, to the country of the Ambuellas, where the same species of immoral hospitality prevails which Holub encountered in Sepopo's domains. This was the cause of much embarrassment to Pinto, two black princes having been sent by their father, king of the Ambuellas, to place themselves at his disposal, in spite of his virtuous obduracy. He was most kindly treated by this king, whose subjects were an industrious agricultural people. In August, Pinto left the capital, marching in a south-easterly direction. On August 24th he reached the goal of his journey, the great Zambesi River, and thus concluded his real exploration. The remainder of the journey to Shoshong, Livingstone's old station, and thence to Pretoria, is devoid of interest, but when the Transvaal is entered names made familiar by the war against the Boers come to the surface, and the ground has been traversed by Dr. Holub. Pinto's astronomical observations generally agree with those of former explorers, except on the middle Zambesi, where they differ from those made by Livingstone by from six to ten miles, and in the Bechuana country along the Limpopo. The position of Shoshong, the residence of King Khame, Livingstone's old friend, and for years a missionary station, differs in Pinto's calculations more than sixty miles from that given by any previous traveller. Pinto's narrative, *How I Crossed Africa*, was published at London in 1881.

Thompson's Journey to the African Lakes.—The East Central African expedition of 1878–79 was projected by the Royal Geographical Society, and placed under the command of Mr. Keith Johnston, son of the well-known cartographer of the same name. Mr. Johnston died at the outset of the undertaking, but Mr. Joseph Thompson carried out fully his instructions and traversed an immense area for the first time, making important discoveries. He was the first to reach Lake Nyassa from the north, to journey between Nyassa and Tanganyika, to march along the west side of the latter, and to pass sixty miles down the Lukuga. Lake Leopold was also visited for the first time, and a great deal of light was thrown on a variety of geographical subjects, such as the rivers Ruaha and Uranga, the mountainous region north of Nyassa, and the interesting question relating to the drainage of the Tanganyika. Thompson's expedition was unique in many ways. There were neither desertions nor deaths (with one exception), plundering by the porters, battles, bloodshed, nor other disasters hitherto supposed to be the inevitable adjuncts of African exploration. Thompson praises the honesty and faithfulness of his men, and he was never under the necessity of firing a shot at the natives. He discovered several new tribes, and on his return to England contributed valuable anthropological knowledge to science.

Schweinfurth's Explorations.—The full record of Dr. George A. Schweinfurth's journey to Monbutto country of Central Africa was not made known until 1874, when his work on the *Heart of Africa* was published. His travels began in 1868, and he spent three years in painstaking research. He passed through the Niam-Niam country, and determined the existence of a dwarf race in Central Africa, a live specimen of which—a Tiky-Tick—he took to Khartoum, where he died. His chief geographical exploit was the discovery of the Welle River on a different water-shed from the Nile. The flow and ultimate debouchement of this stream still furnish (1883) a theme for lively controversy, the most intelligent opinion deciding it to be a feeder of the Congo. Dr. Schweinfurth's journals were chiefly botanical, and their publication has given him a high reputation.

De Brazza on the West Coast.—Lieut. de Brazza's explorations (1875) of the Ogowé River on the West Coast are important as bearing on the question of the sources of the Congo. After his three years' exploration, terminating in 1879, he found conclusively that the Ogowé is a distinct river from the Congo and has no connection with the Central African lakes. He divided the Ogowé into three almost equal parts—the middle portion following the equator, the other two including 1° 30′ to the southward. His exploration of 1878 resulted in the discovery of an important river, the Alima, about 500 feet wide and 16 feet deep, which appeared to be an affluent of the Congo. In descending this river De Brazza was compelled to run the gauntlet of hostile savages who lined the river-banks. He passed great villages filled with enemies, who made fierce attacks in canoes crowded with men armed with guns. De Brazza was compelled to abandon further explorations of this river, and after great suffering reached the French settlement on the Gaboon. During the last months of his journey he and his companion, Dr. Bellay, had to march barefoot, their legs covered with sores, and half starved, a distance of 800 miles over land in a region hitherto unexplored. He also visited the Fans, but differs with Du Chaillu in describing them as a kindly and courageous people. They are cannibals, eating their prisoners of war. De Brazza also made a visit to Akkas, a dwarf race, first seen and described by Du Chaillu, confirming the statements of the latter traveller. On his return to Europe, De Brazza's explorations excited such wide interest in France that the French Chambers voted him 100,000 francs to proceed again to the Congo country in order to found a French colony and establish commercial relations with the tribes. In 1880 he descended the tributaries of the Congo to a point above the long stretch of cataracts. He then marched down the banks of the river, and met Stanley at Vivi returning to the Gaboon and Ogowé by sea. He founded his first station, Franceville, on the upper Ogowé, and a second one, named Brazzaville, on the banks of the upper Congo, at which place a tract of land was obtained from the native chief, and treaties between him and the French Republic were formally signed—a proceeding which gave rise to a protracted and angry controversy in Europe. De Brazza found on reaching the Congo on his final visit that he was not hampered by the Inenga, Galloa, Okanda, and Aduma peoples, whose unfriendly attitude was disastrous to the German expedition. De Brazza (1883) has returned to the Congo region with the avowed purpose of acquiring for the French flag the rich and populous valley of the Congo, having a powerful expedition armed with the finest weapons and supplied with 3000 tons of merchandise and colonial implements. But Stanley has preceded him, and the attitude and actions of the two self-confident explorers, armed with recognized authority as both are, may be attended with important consequences to the future of Central Africa.

Stanley's Expedition for the International Association.—In 1879, Mr. Stanley returned to the Congo, as the agent or viceroy of the African International Association, to establish a line of stations along the upper Congo as far as Nyangwé, to unite at this point with stations from the east coast, thus giving from Zanzibar to the Atlantic a permanent base for explorations of every portion of Central Africa. Stanley had with him a steamer furnished by the association. It drew 14 feet of water, and on its ascent of the river was furnished with a cargo consisting of materials for houses, huts, tents, provisions, and arms, and general merchandise for the establishment of the first station at a place near the Yellela Falls. Stanley took in addition a small steamer in sections, capable when put together of carrying thirty persons, intended to ply the waters of the upper Congo above the cataracts, and also three undecked steam-launches and three large flat-bottomed boats drawing 16 inches. He succeeded in establishing his first station at Vivi, 130 miles from the coast and 5 miles from Yellela Falls, where he erected an iron and wooden house. Thence he pursued his way, with 65 natives and 14 Europeans, up stream. One of the steam-launches was lost over the falls, and the others, with material for houses, had to be carried with great and harassing difficulties for a distance of 300 miles before the river again became navigable. A second station was established at Stanley Pool, above the falls, and this may be called the foundation of the capital of equatorial Africa. Two other stations in the interior were likewise located. He then launched his steamer on Stanley Pool, and sailed away up the stream, branching off and navigating an important affluent flowing from a great lake which he but imperfectly explored. There is no further account of this expedition from Mr. Stanley's pen as yet published in permanent form (1883).

In the latter part of 1882, Stanley returned to Europe. De Brazza being also in Europe, the two explorers engaged in an acrimonious war of words as to the sovereignty of the Congo region—Stanley contending that the French attempt of De Brazza to interfere and reap the benefit of the International Society's explorations and Stanley's discoveries was impudent and unwarranted. French opinion, however, sustains De Brazza, but the other European powers have taken part in the discussion, and the controversy remains unsolved.

Lieut. Wissmann's Journey across Africa.—Lieut. Wissmann and Dr. Pogge left Hamburg for Loanda in November, 1880, but it was June 2, 1881, before they were able to start from Malaush for the interior. They were accompanied by José Germano as interpreter, who was subsequently superseded by a negro, Biseira, a linguistic genius who picked up a colloquial knowledge of Kiswahheli in the course of five days while at Nyangwé. The road to the Muata Yanoos was closed against them, and they turned northward. Their assurance that the Muata Yanoo had charged them to fetch Kohangula's head removed all obstacles which the Lundi chiefs on the frontier might otherwise have placed in their way, for they are accustomed to commissions of this kind, and not inquisitive as to the authority by which they are executed. On Oct. 2d they reached Kikassa, on the Kasai, in latitude 6° 20′ south, and the following day crossed the river into the Tushilange country, where they met Kingenge, a powerful chief who was out with 200 men hunting elephants. Kingenge promised to conduct them to Nyangwé on the Lualaba, and they started in his company. On the way they learned that Mukenge, another chief of the Tushilange, was a more powerful man. In order to conciliate him, the two explorers separated, and while Lieut. Wissmann continued with Kingenge, Dr. Pogge turned off to the left and proceeded to Mukenge's town. The reception of the travellers among the Tushilange was exceedingly hospitable. They were regarded as spirits of departed chiefs come back to revisit the glimpses of the moon, and all sorts of people were introduced to them as claiming kindred. They finally started for Nyangwé Dec. 1. 1881, under the guidance of Mukenge, with fifty of his wives. The Lulua, here flowing over a rocky bed of granite and not navigable, was crossed on the same day, and a densely-peopled region of prairies was entered upon. On Dec. 17th the travellers arrived at Mumkamba Lake, which had been described to them as a vast sea, but turned out to be of very small extent, not being more than three miles in length. It is fed by springs, and fringed with sedge and high grass, and apparently has no outlet. Its elevation above the sea is 2230 feet. Hence they made their way towards the Lubi, a tributary of the Lubilash or Sunkern, itself a tributary of the Congo. The Lubi forms the boundary between the Tushilange and the Basange. They had been previously struck by the great numbers of the wild Tushilange flocking around them, but Lieut. Wissmann states that the Besange were even more numerous. He found them a people friendly, laborious, and highly skilled in all kinds of industrial art, and he took away splendid specimens of their weapons, carved ivory, baskets, inlaid wares, and iron and copper utensils. Leaving these tribes and plains, the travellers entered the vast virgin forests which extend as far as the Lubilash, a stream 1000 feet wide. They found a total absence of fruit trees in this region, and therefore of game and birds. Only elephants and wild boars were met at intervals.

Reaching the Lubilash in 5° 7′ south latitude, they encountered fresh difficulty in the ill-will of the king of Koto, an old and much-revered sorcerer called Kashichi, who rules over a medley of Luba tribes; he would not provide boats for crossing the stream, and it was only by intimidating him by shots and rockets that they induced him at last to listen favorably to their demands. After crossing the Lubilash they passed through the kingdom of the Beneki tribe, of which Lieut. Wissmann speaks very highly. They are an agricultural people, numerous and well-to-do. Their villages are well built and clean, the houses being surrounded with gardens and palm trees. Some of the villages were so extensive that four or five hours were spent in marching through them, and some had two or three rows of houses or streets: the population numbers hundreds of thousands. Hence they passed through the vast prairie-lands inhabited by the tribes Kalebue and Milebue, a densely-populated territory which extends as far as the Lomané, also a tributary of the Congo, beyond which they crossed Cameron's track. The travellers suffered severely from the heavy rains; in fact, they could not have traversed these swamps had they not been mounted on oxen, which are very serviceable animals when bought at Loanda. They jump like English hunters, canter, and trot. Wissmann lost the last before reaching the east coast—a climate in which they cannot dwell, though they are always serviceable in West and Central Africa. Nyangwé was reached on April 17th. Dr. Pogge started on his return journey westward on May 5th, and left only three men with guns with his companion. The latter, however, met with ready assistance from the sheikh Abed-ben-S'alim, an Arab, who furnished him with ten guns and fifteen carriers, with whom, on June 18th, he started for Lake Tanganyika. After repeatedly crossing the routes of previous explorers, he arrived at Plymouth Rock, a station of the London Missionary Society, on July 18th, where he met the Rev. Dr. Griffiths. From this stream he crossed the lake to Ujiji. Guns were few and expensive, and thus Lieut. Wissmann was obliged to start with twenty unarmed carriers. This imprudent step nearly cost him his life. The people of Ukha, aware of his defenceless condition, lay in wait for him near the Malagarazi, and were preparing to put a stop to his further journeyings, when he bared his arm and, pointing to a scar, shouted "Mirambo!" The word acted like magic. The death of a white man with whom the dreaded chief had exchanged blood would surely be avenged, and the plunderers desisted. Mirambo, whose capital Lieut. Wissmann reached Aug. 31st, is described by him as "a capital fellow." From Unanyembe, Wissmann paid a visit to the German station of Gonda to get a pair of boots, finally reaching the coast by way of Mpwapwa. He arrived at Saadani Nov. 15, 1882, having spent twenty-two months and a half in his journey from coast to coast, which he performed with rare prudence, intelligence, and courage.

Minor Explorations.—In 1872, Mr. Vincent Erskine returned from a journey over the vast bush-covered plains along the east coast of Africa from the Limpopo to the Zambesi, an area 600 miles long and 250 miles broad. In 1874, Dr. Nachtigall was the first explorer to visit the eastern half of the Sahara in his journey to Tibesti. He explored Wadaí, crossed Lake Chad, through Darzaheh and Darfour, to the Nile basin, succeeding in a route which cost Vogel and Beurmann their lives. In 1875, Mr. E. D. Young, having nearly £20,000 at his command, established a flourishing mission on Lake Nyassa. This place is called Livingstonia. In 1876 many explorers returned from various parts of the continent—Dr. Lenz from the Ogowé River; Dr. Pogge from Musumbe; Herr Eduard Mohr from the Victoria Lake *viâ* Kenia. The marquis of Antinori, with a splendidly equipped expedition, started for the equatorial lakes in 1875, *viâ* Shoa, which he reached in safety, but finally died without accomplishing his mission. In 1876 a large force of missionaries, under the lead of Abbé Debaize, set out for the purpose of founding missions on the great lakes Tanganyika, Victoria, and Albert Nyanza. These missionaries were all proficient in Arabic. Dr. Stecker, the Rev. J. T. Comber, Dr. James Stewart, M. Comber, Mr. Popelin, Mr. Carter, and Dr. Dutrieux are others who have visited the equatorial belt in the last decade. Mr. Hore, a missionary, made important observations of the Lukuga outlet of Lake Tanganyika. The party to which he was attached have launched many boats on the Tanganyika, and this great inland sea is now navigated by all travellers reaching its shores. The year 1879 was marked by the travel in the equatorial regions performed by M. Debaize, the Rev. C. T. Wilson, and Mr. Felkin, and on the upper Congo by A. McAll and Mr. Comber. Dr. Gerhard Rohlfs in 1879 made an attempt to reach the vast unexplored region lying between the Ogowé River and the White Nile. While contributing largely to geographical science, this intrepid explorer was driven back by the fanatical people of Wadaí. Dr. Holub in the Zambesi region, and Mr. Maples to the north of the Rovuma, also did valuable geographical work during this year. In 1880, Mr. Comber again did good service on the Congo, discovering the great cataract Arthington Falls in the Zombo Mountains east of San Salvador, where the river Brija leaps over the steep escarpment of an interior plateau. During this year valuable discoveries were also made by Dr. Junker. Emir Bey and M. Buchta obtained a wonderful series of photographs of countries lying beyond those visited by Baker and Schweinfurth. There were also several expeditions of a semi-military character across the Sahara and to the upper Niger.

The period under consideration—the ten years from 1873—has also been marked by the publication of the journey to Central Africa of Alvan S. Southworth, formerly secretary of the American Geographical Society; by the scientific explorations of the Austrian Marno westward of the White Nile; by the death of the veteran Miani, who spent nearly the whole of his life in Central and Northern Africa; and by the important contributions of Shuvet to our knowledge of the central region. The various expeditions mentioned in this article have added immensely to our knowledge of the continent, and, taken in connection with the enterprises of the "African Association," of which the king of Belgium is the president, and also of the expeditions now in the field, the results in this period are indeed greater, more multifarious, accurate, and substantial, than all preceding geographical knowledge collected since the African continent was first made known to man. (L. L.—A. S.)

AFRICAN METHODIST EPISCOPAL CHURCH, an American religious body, was organized in 1816, being formed of members who withdrew from the Methodist Episcopal Church. In the early years of Methodism the white and colored members worshipped in the same congregation, the colored occupying seats assigned them. In 1786, upon the building of St. George's Church in Philadelphia, the colored people were assigned seats in the gallery. Trouble followed, and the colored members withdrew; some of them drifted into the Protestant Episcopal Church; some returned to St. George's; others formed an independent association, numbering 66 persons in 1794. Under the lead of Richard Allen, who in 1816 became their first bishop, they purchased a large blacksmith-shop, which was fitted up for a place of worship and dedicated as such by Bishop Asbury. They named their church "Bethel," obtained a charter, and remained for a time under the control of the M. E. Church. The congregation of the Bethel Church remained under the protectorate of St. George's till 1815. More sources of irritation developed themselves, and in April, 1816, a convention was called to meet in Philadelphia. There were five delegates from Philadelphia, seven from Baltimore, three from Attleborough (Bucks co., Pa.), one from Salem, N. J., and one from Wilmington, Del. The convention adopted the name of "The African Methodist Episcopal Church." The Church holds to the twenty-five articles of religion common to Methodism, and its discipline was modelled on that of the M. E. Church. The growth of the Church was slow, but steady, being confined in its operations to the free States and border slave States. In 1822 there were 2 conferences, 17 itinerant preachers, and 7937 members; in 1836, 4 conferences, 27 itinerant preachers, and 7594 members; in 1846, 6 conferences, 67 itinerant preachers, and 16,190 members. After the Civil War the former slave States were open to the Church, and its numbers grew rapidly, thousands coming to it from the Methodist Episcopal Church, South. In 1866 the Church reported 10 conferences, 185 pastors, and 50,000 members. In 1880 it claimed 1418 itinerant preachers, 3168 local preachers, and 214,808 members. This church has a publishing-house in Philadelphia, and an official journal, *The Christian Recorder*. Its chief educational establishment is Wilberforce University, Ohio. (See METHODIST EPISCOPAL CHURCH.) (A. G. H.)

AFRICAN METHODIST EPISCOPAL ZION CHURCH, an American religious body, was organized in 1821. It holds the doctrines that are common to Methodism; its polity is similar to that of the Methodist Episcopal Church, the characteristic difference being that its bishops are elected for four years only, and are consecrated without the laying on of hands. In 1820 a large congregation of colored Methodists in the city of New York, known as the Zion Church, seceded from the M. E. Church, and with one or two other congregations formed an independent organization. The dissatisfaction grew out of steps taken by the New York conference of the M. E. Church to secure more definitely, by legal action, the property used by the colored members in case of a secession. The secession proceeded largely under the influence of the Rev. James M. Stillwell, who had been pastor of the old John Street Church in New York City. Bishop Allen endeavored to induce them to unite with the African Methodist Episcopal Church, but after much consultation this proposition was declined. They did not wish, it seems, at first to be entirely independent of the M. E. Church, preferring to be constituted, with other colored congregations, into a separate annual conference. It was decided that only the General Conference of the M. E. Church could constitute annual conferences, and, disappointed in their plan, they proceeded to hold a conference of their own, June 21, 1821. Joshua Soule (afterwards bishop) and Dr. Phœbus met with them, giving advice. Several local preachers were elected elders, and were ordained by Mr. Stillwell, assisted by two elders who had also withdrawn from the M. E. Church. At their organization they reported 22 preachers and 1626 members. July, 1822, James Varick was elected their first bishop. In 1847 they claimed 75 travelling preachers, 60 church buildings, and 5000 members. After the Civil War the late slave States were opened to them, and their increase was rapid. In 1864 propositions were considered looking to union with the African Methodist Episcopal Church, but the negotiation fell through. In 1880 they were reported as having 1500 itinerant preachers, 2500 local preachers, and 190,900 members. Their chief educational institutions are Rush Academy, Fayetteville, N. C., and Zion Hill, Washington co., Pa. They have a small publishing interest in Washington City. (See METHODIST EPISCOPAL CHURCH.) (A. G. H.)

AGAPEMONE (from Gr. ἀγάπη, love, and μονή, an abiding), a community chiefly residing at Spaxton. Somersetshire, England, 9 miles from Taunton. It took its origin in a praying brotherhood of mystical tendency formed by some divinity students in St. David's College, Lampeter, about 1836. Henry James Prince, leader of these Lampeter Brethren, was ordained at the age of twenty-eight, and became curate at Charlinch, Somersetshire, where the rector of the parish, Rev. Samuel Starky, adopted his views. A revival soon took place, but in consequence of some attending disorder Prince was silenced. With others of the Lampeter Brethren he left the Church about 1859, and began to form the "Abode of Love." In this community the members were to be free from earthly passions, and, though married, to live as though they were not. That they might be separate from the world, they were required to give up their wealth to "The Beloved," as Prince was now called. Money was obtained, chiefly from some spinsters named Nottidge, who became spiritual wives to prominent brethren; land was purchased at Spaxton, and fine buildings were erected. Prince now declared that the time had come for saving the flesh, as Christ had already redeemed the soul of man. Though he had already been married to Mr. Starky's sister, who was living in the community, he took a new bride, but, to the grief of all concerned, a child was born of this union. In consequence of the scandal some of Prince's followers withdrew; lawsuits and other troubles arose, but many members stayed, still accepting "The Beloved's" guidance unreservedly. A hierarchy was formed in which Thomas and Starky were called "The Anointed Ones," while others were angels and witnesses. Some pamphlets had previously been issued by those interested, and in 1862 a volume of lectures was published setting forth the experience of Prince as a new revelation of Christ, but after a proclamation of the salvation of the flesh was sent abroad the leaders resigned themselves to a life of luxurious idleness. Even since the death of Prince (about 1877) the community has continued.

AGARDH, CARL ADOLF (1785–1859), a celebrated Swedish botanist, political economist, and theologian, was born Jan. 23, 1785, in Båstad, in Scania, and was elected professor of botany in Lund in 1812. Agardh gave his special attention to algology, and he may truly be said to have developed this study and given it a scientific basis. He died Jan. 28. 1859. The most important of his numerous works are—*Systema Algarum* (Lund, 1824); *Species Algarum* (3 vols., Lund and Greifswald, 1820–28); *Icones Algarum Europæarum* (Leipzig, 1828–35); *Lärebok i Botanik* (2 vols., Malmö, 1830–32; translated into German by Meyer and Von Creplin); and *Försök till en statsekonomisk Statistik öfver Sverige* (parts 1–3, Karlstad, 1852–59; Ljungberg added a fourth part in 1863).

AGARDH, JAKOB GEORG, a Swedish botanist, son of C. A. Agardh, was born in Lund, Dec. 8, 1813. He became professor of botany in Lund in 1854, and professor emeritus in 1879. He is the author of several important works on botany, among which his *Species, Genera, et Ordines Algarum* (in 4 vols., Lund, 1848–63) is justly celebrated. Of his other works we may mention—*Synopsis Generis Lupini* (Lund, 1835); *Recensio Generis Pteridis* (Lund, 1839); *Algæ Maris Mediterranei et Adriatici* (Paris, 1842); *In Systema Algarum Hodierna Adversaria* (Lund, 1845); and *Theoria Systematis Naturalis Plantarum* (Lund, 1858). Agardh owns a fine collection of algæ, begun by his father.

AGASSIZ, ALEXANDER, an American geologist and zoologist, son of the distinguished Prof. Louis Agassiz, was born in Switzerland in 1835. He came to the United States with his father in 1846, graduated at Harvard College in 1855, and studied civil engineering in Lawrence Scientific School, receiving the degree of B. S. in 1857. He then studied chemistry, and was also engaged in teaching in his father's school for young ladies. In March, 1859, he went to California, and, being appointed assistant in the United States Coast Survey, collected many specimens of fish for the Harvard Museum of Comparative Zoology, then in charge of his father. On his return to Cambridge, Mr. Agassiz was appointed agent of the museum, and studied thoroughly zoology and geology. In 1865 he became interested in coal-mining in Pennsylvania, but afterwards turned his attention to the copper-mines of Lake Superior. Here he spent two years and a half, and, having succeeded in developing the richest copper-mines in the world, became very wealthy. In 1869 he went to Europe, where he examined the principal museums, and on his return resumed his duties as assistant curator of the Harvard Museum. After the death of his father in 1873, Mr. Agassiz was appointed curator of the museum, to the enlargement and endowment of which institution he has devoted much of his time and wealth. Pres. Eliot of Harvard University has stated that Mr. Agassiz has contributed in ten years $230,000 to the museum, besides numerous gifts to other departments of the university. In 1875 he visited Peru and Chili to examine their copper-mines, and brought back a large collection of Peruvian antiquities. In subsequent years he engaged in deep-sea dredging expeditions, investigating regions previously unexplored, and making many important contributions to science. He has published numerous papers embodying original research, as well as reports of the museum under his charge. (For his publications see *Catalogue of the Royal Society of London* and *List of Publications of Museum of Comparative Zoology.*)

AGAVE is a genus of plants belonging to the order *Amaryllidaceæ*, and comprises over one hundred species, with as many more varieties which have been regarded as species, all natives of the American continent. Mexico is their great central home. Fourteen are natives of the United States, chiefly in the arid parts; one, *Agave Virginica*, being found as far north as the Potomac River. The oldest known species is the common century-plant, which was introduced to Spain from Mexico, and from there to England, where one is on record as being cultivated as early as 1561. In the south of Europe it has become wild, and is a striking ornament in the natural scenery of rocky places near the sea-coasts, where it seems particularly to love to grow. The early botanists classed it with the aloes, whence "American aloe," by which it is yet familiarly known. Linnæus first named it "Agave," because that name in Greek indicates "something grand and admirable." Agave, in mythology, was one of the fifty daughters of Nereus, fond of inhabiting rocks along the sea-coasts, thus rendering the name classically appropriate. Its name, "century-plant," comes from a belief that under cultivation it takes nearly one hundred years before it flowers. Specimens have been known to be fifty years old without blooming. In their native country they usually bloom in less than ten years. When it commences to flower the stalk grows often five inches a day, and has been known to reach a height of forty feet and perfect 4000 flowers. These exude a sweet secretion in great abundance, for the purpose, probably, of attracting insects and thus securing cross-fertilization. Some assert that the flowers open with a loud report, even going so far as to compare it to artillery; but this needs confirmation.

It shares with the plantain, bread-fruit, and some others the reputation of being among the most useful class of plants in the world. Bauhin, a famous author of the seventeenth century, remarks of the *Agave Americana*, or common "century-plant," that it is "the maguay tree, from which may be obtained water, oil, vinegar, honey, syrup, thread, needles, and innumerable things of value to humanity." The picture is not overdrawn. Engelmann says that in Mexico an immense quantity of saccharine juice is prepared in its leaves. When the flower-scape shows the first signs of development, the terminal bud and the innermost leaves are removed, when, in the basin thus formed, the liquid collects and is dipped out—on an average about a gallon a day for two or three months in succession; from a single plant 150 to 300 gallons in all. From this juice the fermented (*pulque*) and distilled (*mezcal*) liquors are prepared which are so generally used all over Mexico. It is remarkable that the saccharine character enters only with the flowering condition. At other periods the juice is acrid, though some writers say certain animals relish the leaves. Pulque is the Spanish name for the juice, which resembles cider in appearance, and has an odor so disagreeable to Europeans that it takes some time to become passionately fond of it. The fermented liquor resembles brandy. The trunk is baked, and, under the name of *mezcal*, is regarded as a savory dish. A soap, called *amole*, is made from the roots; a gallon of the expressed juice, the water being evaporated by the sun, yields about one pound of soap, which lathers with salt water as well as with fresh.

But perhaps the greatest value of the Mexican aloes or agaves lies in their fibre. The famous picture-writing of the Aztecs is on paper made from the fibres, which seem to have been laid parallel together and beaten in the process of manufacture. The fibre known in commerce as *pita* is prepared from various species, though in Brazil, according to Dr. J. de Saldanha, pita there is chiefly made from *Fourcroya gigantea*. Some bromeliaceous plants are also believed to yield pita thread. The best-known fibre comes from *Agave rigida* (*A. Sisalana* of some authors), and is commercially Sisal hemp. It is equal to manila, and yields about $250 per acre. Dr. Peyre Porcher says that a crusher used in preparing sugar-cane is effectual for crushing the leaves of the Agave. There is a gum in the leaves which renders cleaning the fibre from the cellular matter somewhat difficult. A stream of water is kept on the pulp during crushing to clean out the gum. Prof. Gabb states that if proper machinery for cleaning the fibre could be invented, the growing of Sisal hemp would be one of the most profitable industries of America. Attempts have been made to introduce the culture to Florida. As early as 1853, Mr. W. C. Dennis had fifty acres planted at Key West, which had given encouraging results up to the commencement of the civil war.

The genus yields little for medical uses. Lindley says that the roots of *A. Americana* are sometimes mixed with sarsaparilla; and Dr. Peyre Porcher states that the negroes of the Charleston district believe *A. Virginica* is a cure for the bite of a rattlesnake, and call it "rattlesnakes' master."

The varieties with striped leaves and narrow leaves, equally with those with gray-green, so common in cultivation, are all forms of *A. Americana*. The most handsome one is said to be *Agave Shawii*, first found in Arizona by Dr. C. C. Parry in 1850, and named by Dr. Engelmann in compliment to Henry Shaw, the founder of the Missouri Botanic Garden. (T. M.)

AGELÆINÆ (Gr. ἀγελαῖος, gregarious), a subfamily of birds of the family ICTERIDÆ or American starlings (which see). It contains the well-known bobolinks or reedbirds (*Dolichonyx oryzivorus*), the notorious parasitic cowbirds (*Molothrus ater* and other species of that genus), the meadow-starlings (*Sturnella magna* and others), and numerous species of marsh-blackbirds of the genera *Agelæus*, *Xanthocephalus*, and others. All are confined to America, several are abundant and familiar species of the U. S., and various others occur in the warmer parts of America. (E. C.)

AGENT, one who acts for and by the authority of another, who is called the *principal*. The term is of very wide application, and includes many classes of persons acting in a representative capacity, to whom distinctive names are given, such as attorneys, factors, brokers, commission merchants, and auctioneers. The law relating to principal and agent is therefore very extended in its application, as a large proportion of the mercantile business of the country is done through agents of one kind or another. The general principles of law relating to the subject are—

See Vol. I. p. 250 Am. ed. (p. 280 Edin. ed.).

1. The acts of an agent, duly constituted and acting within the scope of his authority, are in law the acts of the principal. The legal maxim is, "*Qui facit per alium facit per se.*"

2. The principal is bound by all the acts of his agent done within the scope of his authority. This authority may be given under seal, or in writing not under seal, or orally, and is *general* when it extends to all such acts as are requisite to carry on a particular business or em-

ployment for another, or *special* when it extends only to a particular act. The authority may also be either given in express terms, or implied from the acts of the parties and the circumstances of the case. Thus, a man may send his servant with a written authority to buy a particular article from a shop, but if he sends him habitually to buy there without any written order or other notice to the shopkeeper, and if he pays for the articles so bought, there would be an implied authority to buy anything at that particular shop. So if a merchant places his goods in the hands of an auctioneer or other person whose regular business is to sell goods for others, thereby it may be considered that he creates an agency for the sale of those particular goods. And, in general, where any one is employed repeatedly to do a particular thing, those with whom such person deals have a right to believe that he has been duly authorized to act as an agent for that purpose.

3. The authority of an agent is always presumed to extend to all acts usual and requisite to carry it into effect, unless the contrary is clearly shown. An agency, therefore, to transact a particular piece of business carries with it authority to do whatever may be necessary to make the transaction in its entirety, and a general agency includes the power to do whatever is requisite to carry on the business committed to the agent's charge.

4. The duties and liabilities of an agent are measured by the extent of his authority, and if he acts beyond the scope of his authority he becomes personally liable to his principal, and also to third parties. He is also liable to his principal for misconduct or negligence resulting in a loss. The extent of negligence sufficient to make him liable depends upon the character of the agency: if he undertakes for a compensation to do a thing requiring the exercise of a certain skill for its ordinary performance, he is bound to use such skill; but if no particular skill is necessary, and he receives no compensation, he is not liable, provided he acts in good faith and to the best of his abilities. He is bound to take good care of the property of his principal entrusted to him, and to keep books and render true accounts of his transactions. (See PRINCIPAL AND AGENT.) (S. W.)

AGNOSTICISM is a name which has come into use to express the doctrine of those who hold that no knowledge of absolute reality is possible. It is employed more especially in connection with the doctrine of Mr. Herbert Spencer and his followers, who hold, in the language of Mr. Spencer, "that our own and all other existence is a mystery absolutely and for ever beyond our comprehension."

Analogous views have been maintained by some in all ages of the history of philosophy, and on grounds generically identical with those on which modern Agnosticism is founded. Agnosticism expresses the alleged final result of the science of knowledge. It consists in the affirmation of a certain limitation of human knowledge. But this affirmation can of course only result from an examination of the actual range, nature, and process of human knowledge. The agnostic holds knowledge to be a purely mechanical process. It is the obverse, or reverse face, of a system of nervous shocks, variously compounded, but having their origin wholly in causes which are either external in the organism or else have been, by heredity, transmitted to it, and, as it were, embedded in it. In either case the shock or the corresponding conscious state is mechanically determined. That knowledge, on one of its important sides, is dependent on mechanical or physical conditions, has never been doubted. The agnostic makes the whole science of knowledge to consist in the analysis of these conditions. It is admitted by him that the conditions and the result dependent on them are absolutely incommensurate, so that it is altogether impossible to see how the former can be the cause of the latter or stand in any sort of relation to it. Yet the fact is, that they do stand in relation; and, resting on this fact, the agnostic goes on to interpret the whole nature and process of knowledge after the analogy of the conditioning physical process.

The result is, that all knowledge is held to be strictly and exclusively sensible knowledge. It consists of sensitive states or feelings mechanically determined, and is purely individual or primarily restricted to the states and feelings of the individual subject. The fundamental notion is the old one, according to which the "mind," the apparent agent of knowledge, is a *tabula rasa*, or like a piece of white paper, upon which, then, objects by mechanical impact produce impressions, out of which knowledge is compounded. Naturally, if this be the complete notion of mind as agent in knowledge—and not, the rather, a partial one—the inference must follow that the mind knows only impressions, or, in other words, its own modifications and states, and not itself in its own essence, or the real objects themselves which are supposed to affect it. All that is known is the relative or sensibly phenomenal—not the absolute or noumenal, or "things-in-themselves."

The logical result of the foregoing views is complete philosophical scepticism. It renders the very conception of the Absolute unaccountable. A broader and completer science of knowledge accounts for it by showing that the agnostic or sensational theory of knowledge is partial, corresponding only to a certain, restricted portion of the facts of the case. The account which the agnostic himself gives of it is full of contradiction and confusion. It suffices to add that Mr. Spencer holds the absolute and "Unknowable" to be an universal and "persistent Force." With this conception —of "Force"—he has already transcended and practically refuted his own theory of knowledge.

The position of English Agnosticism differs from that of Kant in that, among other things, it admits no such distinction as that which was made by Kant between theoretical and practical knowledge. Kant did indeed identify theoretical knowledge with sensibly-conditioned knowledge, and so concluded that the Absolute is theoretically unknowable. But, "practically," nothing was more evident, in his view, than that man is, absolutely considered, a supersensible.—*i. e.* a spiritual—being, free and responsible, and destined for immortal life in a spiritual kingdom, of which God, the Absolute Being *par excellence*, is the monarch. We may say that in taking this position Kant was *formally* inconsistent with himself, while *substantially* he was only placing himself in express agreement with the real presuppositions of his own theory of sensible knowledge itself, with the fundamental facts of real experience, and with the results of that fuller and more complete science of knowledge which is established in the grander forms of philosophic inquiry, both ancient and modern.

The English agnostic denies freedom, and names not God. (G. S. M.)

See Vol. I. p. 255 Am. ed. (p. 285 Edin. ed.).

AGOUTI, the common name for about ten species of rodents constituting the genus *Dasyprocta*, and by some (*e. g.*, Alston) considered as typical of a peculiar family, *Dasyproctidæ*—*Cœlogenys* being an associated genus. The agoutis are limited to tropical and sub-tropical America. The tail is obsolete or short, the rump covered with long hairs, and the claws are short and hoof-like. The species are closely related, and Alston has found "the coloration of the long hairs of the rump to be the most trustworthy" characteristic. The oldest known and typical species, *D. aguti*, inhabits Guiana, Northern Brazil, and Eastern Peru; another, *D. acouchy*, distinguished by a more developed and slender tail and smaller size than other species, is found in most of the same range, but not in Peru. One species, *D. Mexicana*, occurs in Mexico; at least two, *D. punctata* and *D. isthmica*, in Central America, and one, *D. cristata*, in the West Indies. The others are South American. The remarks as to the habits and edibility of the common species in the article AGOUTI in the ENCYCLOPÆDIA BRITANNICA are essentially applicable to all the species. (E. C.)

AGRICULTURE (AMERICAN).

CHAPTER I.

HISTORY.

See Vol. I. p. 259 Am. ed. (p. 291 Edin. ed.).

THROUGH the whole course of American history the tillage of the soil has been the employment which has occupied the greater part of the American people, and the products of this industry have been the most important of their country's exports. The decennial censuses furnish the following figures as to the employment of the people. The first column refers to the total of those engaged in definite occupations—*i. e.*, those specified in the other columns:

	Total engaged in Occupations.	Agriculture.	Manufacturing, Mechanical, and Mining pursuits.	Commerce and Transportation.	Personal and Professional Services.
1840...	4,796,407	3,717,756	806,748	206,667	65,236
1850...	5,371,876[1]	2,400,586	1,034,469	561,796	996,318
1860...	8,287,043	3,305,135	1,311,446	529,335	
1870...	12,505,923	5,922,471	2,707,421	1,191,238	2,684,793
1880...	17,392,099	7,670,493	3,837,112	1,810,256	4,074,238

[1] The census of 1850 under this heading specifies "males over 15 years of age."

First Period, 1610–1783.

Before the settlement of the country by Europeans the aboriginal population was divided into three classes. The inhabitants of the more densely settled portions, from Arizona southward to Peru, were an agricultural —or, more strictly, a horticultural—people, living in large *pueblos* of adobe or stone. The wilder tribes in the farther north and south lived by hunting and fishing, and dwelt mostly in villages of wigwams. An intermediate class combined the two modes of life, and were housed in large structures made of poles and thatched with reeds. With this intermediate class the English came into contact first. Captain John Smith says of the Indians of Virginia:

> "The greatest labor they take is in planting their corn, for the country is naturally overgrown with wood. To prepare the ground they bruise the bark of the trees near the root; then do they scorch the roots with fire, so that they grow no more. The next year with a crooked piece of wood they beat up the weeds by the roots, and in the mould they plant their corn. Their manner is this: They make a hole in the earth with a stick, and into it they put four grains of wheat [*i. e.*, maize] and two of beans. These holes they make four feet one from another. Their women and children do continually keep it with weeding, and when it is grown middle high, they hill it about like a hop-yard. In May also among their corn they plant pompeons."

These were the methods suggested by native practice to the first colonists, who found a climate differing from that of England in its extremes of heat and cold, a soil fertile but unbroken, and covered with dense forests, and natural products widely different from those of the mother-country. They brought with them the practices of English agriculture as these had been developed in the seventeenth century, but they were obliged to adapt these to new conditions. The first want of the colonists was live-stock. In 1607 a few cows were brought over to Virginia, and, while the importation continued for some time, their slaughter was forbidden under pain of death. In 1620 the number had reached 500; in 1639, 30,000. Edward (afterwards Gov.) Winslow of Plymouth imported the first cattle into New England in 1623. In 1626 twelve cows reached Cape Ann; in 1630 one hundred were brought over at the expense of the colony. About the same time a hundred and three horses and cattle were imported from Holland into the Dutch colony on the Hudson, and afterwards many cattle of the large yellow breed from Denmark. The ancestors of our Texan cattle were brought into more southern latitudes by the Spaniards. From these stocks sprang our common or native breeds of cattle. They were fed on the "fodder" of Indian corn and on native grasses; and in the settlement of towns in New England care was taken to reserve common pasture-lands, after the model which still existed in England. Not until 1677, when the perennial rye-grass was introduced, was there any systematic cultivation of fodder grasses. For this reason, and because of the severe droughts and long winters, and their exposure to the weather unhoused, the cattle degenerated in quality while increasing in numbers. *Sheep* were introduced into Virginia as early as 1609, and by the year 1648 there were three thousand there. It was customary in the colonies for a farmer to raise enough wool to clothe his family in homespun cloth, but there was no improvement in the breeds until the present century. *Swine* were brought over from England at an early date, and as they multiplied rapidly, but few importations were needed. As they foraged in the forests, they also degenerated rapidly.

Although geological discovery shows the *horse* to have been a native of America at a very remote period, the species was extinct before the settlement of the continent by any of the races of aborigines found by Europeans. The Aztecs of Mexico at first thought the horse and his Spanish rider a single animal. From the horses introduced by Spaniards, Dutch, and English are descended our common horses. A few thoroughbreds were imported in the later colonial era, but little attention was paid to breeding until well into the present century. Indeed, the ox was found a better beast of burden in a new and heavily-wooded country than the more nervous horse. The South, with its mild climate, bad roads, and abundant leisure, wanted a horse for the saddle and the race-course, and took an interest in English thoroughbreds. The Puritan element in New England discouraged trials of speed.

The crops in colonial agriculture were both exotic and native. From England came those great cereals which the Aryan race had brought with them from their primitive seats in Central Asia. Among the English colonists *wheat* was planted first in 1602 by the explorer Gosnold on one of the Elizabeth Islands, in Buzzard's Bay. It was sown in Virginia in 1611, and remained the staple crop until about 1648, when it was superseded by tobacco. In the Northern colonies it was found subject to blight and to mildew. By 1750, New Jersey had taken the lead in wheat-growing, but maize and potatoes were more usual crops. *Oats*, *rye*, and *barley* were introduced early, and rye meal was mixed with corn meal for bread. *Buckwheat* was brought by the Dutch from the East Indies and sown for fodder at first. *Potatoes*, of the white or "Irish" species, are natives of South, but not of North, America. They were brought here from the British islands, but were not grown extensively until the eighteenth century. Their first cultivation in New England is ascribed to the immigrants from Ulster who settled in New Hampshire and the adjacent parts of Maine. By 1747 we find South Carolina exporting 700 bushels. *Rice* was a staple crop in the Carolinas and Georgia. An upland rice grows wild in Maryland and Virginia, and a hardy species grows freely in Northern Minnesota, where the Indians use it as food. But the rice of our agriculture is an exotic, and was brought to Virginia in 1647. In 1694 a supply of rice-seed was procured in South Carolina through the accident of a vessel bound for Charleston having been forced to put in for supplies at Madagascar.

Of native crops, the first in importance was maize, or *Indian corn.* It had been the staff of life with the more settled tribes of the aborigines; it became that of the colonists. As hominy, as hasty-pudding or mush, as pone bread, or as succotash (corn mixed with beans), it appeared on every table from Maine to Georgia. It was tilled much in the Indian way, except that the seed-grains were covered in the "hills" with a mattock or a grub-hoe, instead of a clam-shell. The Plymouth colonists manured their corn with the fish called alewives. *Squashes, pumpkins, watermelons*, the *sweet potato*, and its congener the Georgia *yam*, were adopted from the aborigines. In the Southern colonies, beginning with Virginia and Maryland, *tobacco* came into prominence very early as a staple. By 1622, Virginia was producing 60,000 pounds, and in twenty-five years the amount was doubled. From 1744 to 1776 the export averaged 40,000,000 pounds a year. But the continual cultivation exhausted the land, and obliged planters to give more attention to wheat and other cereals. *Cotton* is native to the West Indies, but the first attempt at its cultivation was in South Carolina in 1733 with seed imported from Smyrna. It was grown as far north as Pennsylvania, chiefly with a view to clothing the negroes cheaply, and small quantities were exported. *Indigo* is no less native to America than to Hindostan, from which it takes its name. Its cultivation in the South was attempted first about 1740, from imported seed, but the planters found the indigenous species more profitable. In 1747 the export reached 134,118 pounds; in 1756, 216,924 pounds. In the year preceding the War for Independence the export was over 1,000,000 pounds, of which England consumed half and re-exported the rest. The native *grasses* were the object of much less attention than they should have been. Timothy grass was found growing in a New Hampshire swamp early last century by a farmer named Herd, and was carried from New York to the Southern States by Timothy Hanson about 1750.

The want of proper *tools* was a great hindrance to colonial agriculture. Wood and a brittle metal made from bog ore were the only materials accessible. In 1617 ploughs were introduced into Virginia, and in 1648 there were one hundred and fifty of them in use. For twelve years the Plymouth Colony had none, and in 1637 the number in all Massachusetts was but thirty-seven. It became customary for the owner of a plough to hire it out to his neighbors. As the ploughs were of wood and very large, it required a stout team to draw one through even the surface soil, with one man to hold the stilts, one to "bear on," and a third to drive. The other farm implements were the spade, the sickle, the grub-hoe, a clumsy wooden fork, and later the harrow.

This brief review shows how slowly and laboriously the foundations of our agricultural system were laid. Partly, this tardiness was due to the repressive policy by which the mother-country kept the colonies in a state of commercial as well as political dependence, preventing the growth of those manufacturing industries which are needed to fertilize agriculture. Only the coarsest of the metallic industries were permitted to the colonies. The colonists brought to America English ideas of comfort; they were obliged, as far as laws could effect this, to seek the satisfaction of their wants in England.

An English writer, Gee (*On Trade*, London, 1750), says: "If we examine into the circumstances of the inhabitants of our plantations, and our own, it will appear that not one-fourth part of their product redounds to their own profit; for out of all that comes here they only carry back clothing and other accommodations for their families, all of which is of the merchandise and manufacture of this kingdom. . . . All these advantages are received from the plantations, besides the mortgages on the planters' estates and the high interest they pay us, which is very considerable; and therefore very great care ought to be taken that they are not put under too many difficulties, but encouraged to go on cheerfully."

Besides this, the general use of slave-labor tended to discourage the white man from exerting himself, by making toil a badge of disgrace. The disposition to favor the existence of great estates, which was seen in the legislation of New York and the Southern colonies, was another hindrance to general prosperity.

A still more serious obstacle was found in the scantiness of the population and the absence of opportunity for close association and united effort in the mastery of Nature's resources. The first settlers of such a country as this always have a difficult undertaking. They are obliged to content themselves with those elements and resources of the soil which are the most easily accessible; and these seldom are the most valuable, or the most capable of development through human labor. The best lands, and often the best resources of lands actually taken, are left till a time when a greater concentration of human energy for their utilization has become possible.

The early settlers of America were not progressive or scientific agriculturists. They fell easily into a settled routine, and whoever departed from it did so under penalty of social censure. They had no respect for "book farming," and the only book on the subject before the War of Independence was *Four Brief Essays on Husbandry*, published by Rev. Jared Sparks of Connecticut in 1747.

Second Period, 1783–1833.

The War of Independence put a stop for the time to any development of agriculture, and at its close the colonists were in a deplorable condition. Their live-stock had been reduced by the war. They had no money, no markets, no roads, no machinery, no well-established government, no common fiscal system. They had little more than a plenty of virgin soil, a scanty population, a few navigable water-courses reaching to the sea, and an indomitable purpose to make their country great and self-sufficient. Under these conditions they laid the foundations of a system of agriculture so wise in the distribution, legal transfer, and ownership of land, and in the selection and rotation of crops, that it has continued ever since without material change. The application of machinery, the growth of numbers, the abolition of slavery, the acquisition of the public domain and its opening to settlers, have been the chief causes of modification, but even these have not altered its character fundamentally.

The American *rotation*, so far as any general statement may be made of a country so various in climate, soil, and the inheritance of method, consists of two years of clover, one of corn, one of oats, barley, or flax, and one of wheat, with now and then a year of fallow. With the single exception of sorghum, all the domestic animals, grains, grasses, fruits, and vegetables we now have were in use at the opening of this second period. Our improvements have given us more fruitful and profitable varieties, but have made them less robust also, and more accessible to their enemies.

The Southern States were in a worse condition at the close of the War of Independence than the rest of the country. The staple crops of the Carolinas and Georgia had been rice and indigo; but the English conquest of a large part of India, and the establishment of the compulsory cultivation of indigo in Bengal, had transferred that business to the East. Although the cultivation and export continued for a time, the latter amounting to 1,550,880 pounds in 1794, the price had fallen so low that it was no longer profitable. Cotton and silk had been produced in small quantities in the colonies, and were exported to England, but in the treaty with Great Britain cotton was classified as a product of the West Indies, which American ships were not to carry into England. To stimulate its production in the South a duty was imposed in 1789 on the importation of raw cotton, and maintained until 1846. The invention of the cotton-gin in 1794 by Eli Whitney, and the care taken by American planters to improve the stock by careful selection and cultivation of seed, soon placed the country in the foremost rank in the production of this great staple.

The greatest improvement in *implements* during this period was in the plough. Thomas Jefferson's attention was directed to the subject. From 1788 till 1793 he was making experiments with a view to improving the clumsy "bull-plough" of English origin, still in use in America; and to his son-in-law, Col. Randolph, we owe the first "hillside plough." After a series of inventions came the plough of Jethro Wood of New York in 1819, which reduced the weight of the structure by simple and ingenious methods of fastening the parts to each other, and at the same time allowing of easy replacement of worn parts. From this time improvements were continuous, and the application of mathematical science to the problems of construction have given the American farmer a perfect instrument. The subject of *reaping-machines* attracted attention in England before the close of the century, and two were invented in America during this period. But the perfection of the machine belongs to our next period. The great improvements in *mill-machinery* effected by **Oliver Evans** (*q. v.*) may be regarded as properly a part of this history.

The improvement of our *horses* may be said to have begun during this period. The importation of Messenger to Philadelphia in 1788, after he had achieved some reputation on the English turf, marks a beginning, as many of our best horses (Hambletonian, etc.) trace their pedigree to him. Even more famous for his descendants is the stallion Justin Morgan, foaled at Hartford in 1793. A third family is the descendants of Black Hawk, which belongs to the next period. Most of the States forbade racing, and the first public trotting-match was run in New York in 1818. From that time, trotting, which had been despised through the force of English traditions, became the fashion. The gait had been encouraged as a useful, practical, sinless one, while running was associated with gambling. The double effect has been the production of a large number of superior roadsters—horses of courage, endurance, and speed such as no other country possesses—and a deterioration of the farm-horse. Inferior, warm-blooded horses have been bred to nondescript mares, with the result of decreasing size and bone and increasing the temper, without any corresponding gain. Their anatomical proportions are often bad, their limbs too light for the work required; and in one American county may be found more unsound horses than in all the horse-districts of France or Scotland. We owe the excellence of our roadsters to the preference for sleighs and carriages to the saddle—a preference compelled in the people of the North by the severity of the winter, and encouraged by the excellence of our wagons. The mustang of the Plains and the saddle-horse of the South are equally the product of necessity. For the plantation-work the Southern horse is too spirited, and is replaced by the mule.

About 1825 attention began to be given to *neat cattle* and their improvement. The colonial stock had increased in number, but declined in quality through the want of attention to their winter quarters and to their food. In 1792, Durhams were imported into New York; in 1793, into Virginia and Maryland; and by 1797, Kentucky had begun to pasture superior cattle in the blue-grass region, whence they spread to Ohio. But these were exceptional, and the systematic cultivation of pure-breed Devons in the East began toward the close of the period.

During the War of Independence the slaughter of *sheep* was discouraged, and even forbidden, in order to increase the supply of wool. Toward the close of the century the importation of superior English breeds was begun. From two of these and a Persian ram owned by General Washington are descended the long-woolled Arlington sheep. In 1801 the merino sheep was introduced successfully from both France and Spain, and this breed obtained general preference. Its improvement under American hands has produced the American merino, a distinct and superior type. But the War of 1812 found the country very imperfectly supplied with both wool and woollens, and gave a great but temporary impulse to sheep-breeding. In 1810 wool was sold for $1 a pound; in 1812, for $2.50, and ram lambs for $1000 each. In 1815, on the return of peace, full-blooded sheep sold for $1, and thousands were slaughtered for their pelts. This depression was not corrected until the tariffs of 1824 and 1828, especially the latter, which imposed high duties upon both wool and woollens and led to renewed importations of good English stocks. But no industry, except perhaps the culture of hops, has been marked by such fluctuations of prosperity and depression. The reasons are obvious. The sheep is an animal demanding an amount of personal care and interest which can scarcely be procured for it in a country where labor is dear. Americans are not a mutton-eating people, beef and pork being always cheap and plenty. The enormous depredations by dogs are not usually checked by any adequate legislation, and in some districts they make sheep-raising impossible. The changes in the tariff alternately encourage the farmer to invest in sheep, and then strip him of his reward by putting his labor on the same level with that of the ill-paid and ill-fed shepherds of Europe. The success we have had must be traced to the indomitable spirit of the American people, the abundance of land, and the encouragement given by high duties on wool during certain periods of our financial history.

A notable fact of this period was the great extension of the national area by the acquisition of Louisiana in 1803 and of Florida in 1821. From 890,615 square miles in 1783 the country was enlarged to more than two million square miles in 1833. To utilize the northern part of the Mississippi Valley two great routes westward were created—the National Road through Wheeling and Columbus by the United States Government, and the Erie Canal by the State of New York. From the year 1812 steamboats began to appear on the Western rivers and lakes, and thus converted these great water-ways into channels of rapid commerce. The era of railroads was just beginning in 1833, there being then only 380 miles in operation.

Third Period, 1833–60.

The opening years of our third period were anything but auspicious. After a brief time of great speculative enterprise, in which the sales of public lands rose to nearly fifteen million dollars in 1835, and nearly twenty-five millions in 1836, came years of general prostration, which continued until 1842. In 1837–38 we were obliged to import several million dollars' worth of breadstuffs. But from this depression the country recovered with equal rapidity. The addition of Texas in 1845, and of the northern portion of the republic of Mexico in 1848, to our national domain, the settlement of the Maine boundary in 1842, and of the Oregon boundary in 1846, established for the nation the limits which practically still define its area at three millions of square miles. The rapid growth of the West and the far West as agricultural communities carried the centre of population across the Alleghanies, and gave the country a new physiognomy.

The first great event of the period was the invention of the American *reaper* by Hussey of Maryland in 1833, and by McCormick of Virginia in 1834. For the next twenty years improvements were continuous, and have proved its excellence in foreign trials of the American reaper, secured the European market, and have enabled it to break down prejudice at home. It was not until about 1850 that the usefulness and profit of the reaper were acknowledged universally by our farmers. Long after the time of Hussey's invention they clung to the then recently invented *cradle*, which had superseded the old sickle. The reaper enabled the production of wheat to outrun the growth of the population. Since 1850 the production of wheat has advanced more than twice as fast as the increase in the population; whereas in the decade 1840–50 it hardly kept pace with that growth.

Part of this increase was due to events abroad. In 1847, England abandoned the policy of protecting her farmers, and threw open her grain-market to the world. A responsive movement in America was the tariff of 1847, which admitted foreign manufactures more freely to our markets. At the same time, a large amount of English capital was invested in American lands, often by the owners of great English estates, who tried in this way to retrieve the loss of their monopoly at home and to keep the supply of the British market in their own hands. The whole period was an era of great *land speculations*, which came to an end with the passage of the Homestead Law at its close. The system of *land-grants* to promote the building of railroads was begun in 1850 with the grant to the State of Illinois of the alternate sections on each side of the Illinois Central road, six sections in width (being more than the area of the State of Connecticut), on condition that the road, then bankrupt and unfinished, should be completed. Before this period ended 32,458,200 acres had been voted to thirteen States for the construction of forty-one railroads. By 1860 there were 30,635 miles of road in operation.

Great improvements in *stock* were effected during this time. Many *cattle*, not only of the short-horn, but of the Ayrshire and Jersey breeds, were imported both before the depression of 1837 and when the interest in cattle revived after 1850, and there was a greater demand than ever for animals of pure breed. Even the depression was not without its benefits, as it caused a dispersion of herds of pure blood, which led to a more general improvement of ordinary stock. The era of importations ends with 1860, although the price of good stock has continued to rise, and that of exportation has taken its place.

The improvement in American *swine* began in 1832 with the importation of Berkshires, but was stopped by the great fall in prices toward the close of the decade. Between 1850 and 1860 importations were resumed, and most of the English improved breeds were brought over, but in small numbers. No general dissemination of improved animals, native or imported, took place during this period. But valuable American breeds were originated to meet our local wants, as experience showed that English swine were not well adapted to all our localities and conditions.

In *sheep* also improvement was intermittent. In 1846 and subsequent years Edwin Hammond of Vermont perfected the American merino on the foundation laid in 1813 by Stephen Atwood of Connecticut. But after the repeal of the tariff of 1828, and with the exception of the period 1842–46, but little protection was given to wool. In the decade 1850–60 the number of sheep advanced from 21,723,220 to 22,471,275, or less than 3·5 per cent., and the average weight of the fleece from 2·42 pounds to nearly 3 pounds.

The improvement of American *horses* continued on lines already indicated, while the *mule* continued to serve on the Southern plantation. In 1860 there were nearly half a million of mules and asses, and about the same number of horses, in the four States of Kentucky, Georgia, Alabama, and Mississippi, and but little over a million mules and asses to six million horses in the whole country.

The improvement in live-stock was made possible by the general cultivation of *grasses* and *clovers*, and especially by feeding under cover during inclement weather. These two crops have become in most parts of the country the bulwarks of a profitable agriculture. The yield of hay rose from 10,250,000 tons in 1840 to 13,838,642 tons in 1850, 19,083,896 tons in 1860, 27,316,348 tons in 1870, and 35,205,712 tons in 1880, being an increase of nearly 244 per cent. in forty years.

The increase in cereal crops noted above was due to many other advances in the construction of *implements* besides the invention of the reaper. The American plough had attained its complete development. Threshing-machines had superseded the flail. To the steam thresher was added a cleaner attachment. The labor of stacking the straw was got rid of by a stacker. The portable steam-engine relieved the horses of much toil. And in connection with the reaper the improvements were constant, and suggested by the farmer's experience. One mechanic does away with the side draft; another attaches the self-rake; another elevates the grain and the binders ride. Still the labor is too great, and a self-acting wire-binder is added, but the thresher and miller disliking the wire, after a hundred essays with twine success is reached. The resultant machine is as complicated as a locomotive, but the American farmer learns its management in a day. The whole story, with its result in the increase of food-products, shows the intellectual vigor, the mechanical insight and aptitude, of both the mechanic and the farmer, but especially the enterprise, courage, and patience of the latter.

Marked improvements in *farm buildings* belong to the next period rather than to this. The American farm of this period, except in Eastern Pennsylvania and New Jersey, was furnished ordinarily with a single outbuilding or "barn," 30 by 40 feet, and 14 feet high, and plain as a dry-goods box. It was covered by a roof of slight incline and without projecting eaves, and was flanked by one or more low open sheds. Here and there a basement story was added, but so low and damp that it might be called a cellar. As wants increased, they were met, not by enlarging or improving the barn, but by putting up other small buildings, and a score of such might be seen scattered over two or three acres. These arrangements grew out of copying English plans rudely, but the waste of labor and of manure was excessive. A better style prevailed among the farmers of German stock in the district we have mentioned as exceptional, and furnished the starting-point for our later improvements. It was characteristic of the Pennsylvanian German that his barn was several times larger than his house, and hardly inferior in comfort.

In the matter of *drainage* some progress was made. The earlier settlers had preferred soil which furnished natural drainage, but the growth of population had made it imperative to introduce artificial drains. Without aid or encouragement from the Government, and with no traditional knowledge of methods, the American farmer, while yet a pioneer, often removed obstructing stones from the surface, broke them up, and placed them promiscuously in narrow trenches. These crude underdrains were very helpful, but experience soon taught the construction of better ones by placing unbroken stones, so as to leave a well-defined throat for the passage of the water. Another primitive V-form of drain was made, but very temporary, by filling trenches pretty compactly with bushes, and covering these with soil. In 1836 the drain-tile was introduced, but it did not come into general use until the rise in the price of land made it more profitable to increase the product of the farm than to extend its area.

In the matter of *irrigation*, so much needed in the farther West, a beginning was made by the Mormons at Salt Lake City in 1847. The Great American Desert, of which Utah is a part, is so saturated with alkali that it seemed destined to grow nothing better than sage-brush. An old mountaineer told the Mormons he would give them a gold dollar for every head of wheat they would grow in the neighborhood of Salt Lake City. But by skilful dispersion of the streams from the mountains they managed to bring over 250,000 acres under cultivation, and to produce crops which might challenge comparison with those of the prairies from which they had been driven. More important than their actual achievement is the proof it gives of what may be effected for a great part of this otherwise desolate region.

American farmers were beginning to learn the better economy of *manures*. In multitudes of cases valuable fertilizing substances were thrown into streams; it was not unusual to see a rivulet making its way from the farmyard to the nearest creek; and much stable manure lay leaching under the eaves of the barns. The notion that some return must be made to the soil for what the crops abstracted was slow in effecting a lodgment in the average farmer's head; and in this matter our farming practice still lags behind knowledge. Guano and other commercial fertilizers began to come into use. By 1860 there were forty-seven establishments, which produced fertilizers to the annual value of $891,344. But at first the prices asked were twice or four times their value. The growth of competition among producers and the diffusion of chemical knowledge corrected this.

The cultivation of *wheat*, as already noticed, increased with great rapidity, especially in the West. From colonial times till about 1855, Pennsylvania held the first place. Then it passed to Ohio, and five years later to Illinois, the lands of the upper Mississippi Valley being found admirably adapted to its growth. A formidable enemy to the crop had existed from Revolutionary days in the Hessian fly, but this difficulty was obviated a good deal by the substitution of red or Mediterranean wheat for the old white variety. The *corn*-crop also outran the growth of our population, rising from 377,531,875 bushels in 1840 to 838,792,742 bushels in 1860. The exportations begun during the Irish famine secured a new market for this cereal among the poor of Northern Europe, where maize cannot be grown. But the Western farmer generally finds it more profitable to convert it into beef or pork before export.

The culture of *rice* reached its maximum in 1850, when the crop was 215,313,497 pounds, grown chiefly in Georgia and South Carolina. The reports of 1860 show a fall to 187,167,032 pounds. Between a third and a half of the crop was exported, and was worth about two millions of dollars. Even before the abolition of slavery the competition of the cheaper labor of impoverished Hindostan had begun to make the culture unprofitable, and especially as the yield to the acre —600 pounds—is much below that of our other cereals.

The westward extension of our Southern area gave a great impulse to the cultivation of *cotton*, and at this time the crop had come to be the largest and best in the world. In 1831 the total was a trifle over a million bales, and this was doubled in 1840. In 1852 a third million was reached, and in 1859 the total was 4,669,770 bales. In 1856 the rest of the world produced a little more than half a million bales, but the United States more than seven times as much. Exports of this staple reached their maximum in 1860, when we sent three and three-quarter millions of bales abroad. No marked improvements in method of tilling or handling the crop belong to this period.

The production of *sugar* became an American industry by the annexation of Louisiana, the attempts to cultivate it in the South Atlantic States having proved failures. In Louisiana in 1832 and 1839 the product was over 100,000 hogsheads of 1300 pounds, and after 1842 it kept above this. It reached its maximum in 1861, the crop being 469,410 hogsheads. The yield varied much from year to year through injuries from frost, and at no time came near to supplying the national demand. The production of *maple-sugar* for local use was a business of some importance in the Northern States and in Kentucky, the product of 1860 being 40,120,205 pounds of sugar and 1,597,589 gallons of syrup, New York, Vermont, Michigan, and Ohio taking the lead. That of *beet-sugar* was attempted repeatedly, but always without a proper regard to the conditions essential to success, and therefore with failure as an unvarying result. The *sorghum cane* was introduced in 1847 from China, and for a time great results were expected, but experience showed the Northern farmer that with the apparatus accessible nothing beyond an inferior quality of molasses could be obtained. Of this 6,749,123 gallons were made in 1860.

The cultivation of *tobacco* advanced rapidly after 1825, but from 1840 to 1850 it was at a standstill; yet the product was more than doubled in the next decade. Kentucky and Virginia kept the lead, but the cultivation began to extend into the Northern States, their product rising from 16,793,233 pounds in 1850 to 66,857,583 pounds in 1860. The constant exhaustion of lands by the continued culture of this crop without return to the soil was still a reproach to our agriculture.

The cultivation of the *potato* reached its maximum before the outbreak of the disease which now afflicts it, in the fifth decade of the century. The crop of both white and sweet varieties fell off from 108,298,060 bushels in 1840 to 104,056,044 bushels in 1850. It occurred to Rev. Chauncey E. Goodrich, a Presbyterian pastor of Utica, N. Y., to renew the stock by importing fresh seed from South America. To him we owe the Chili, the Goodrich, the peach-blows, the early rose, and other new varieties. The potato-bug, though known on the upper Missouri in 1824, and again reported in 1859, had not yet become a pest.

Until about 1840 the *literature* of our agriculture was almost confined to the transactions of societies formed for its promotion. In 1839, Congress voted $1000 for the investigation and collection of agricultural statistics and to procure seeds and cuttings for gratuitous distribution. This was the beginning of Government reports, which were issued through the Patent Office until the Department of Agriculture was organized in 1862. Between 1840 and 1850 five State societies were formed, and from this time State and district associations increased rapidly. The official literature issued by these and by the general Government contains many valuable papers and statistics, but so badly arranged and indexed, and so smothered under trivial matters, as to be of small available use. With 1850 begins the age of books and pamphlets—sometimes of no worth, but more often valuable and apposite to American circumstances. This is especially true of what has been written on economic entomology, pomology, gardening, and dairying. Many which pass as American, however, are "an imported article with a false trade-mark." Our first agricultural paper was the *American Farmer*, begun at Baltimore in 1819, and from that time there has been no interruption in the series of such periodicals or in their improvement. They now form a large and important section of American periodical publications.

Fourth Period, 1860–83.

The War of Secession would have inflicted a much severer injury upon our agriculture than it did, had not the previous inventions of labor-saving machinery made it possible still to reap and garner the grain-crops which fed our people, our armies, and a large part of Europe. As it was, the South suffered much more than the North. The exclusion of her crops from foreign markets by the blockade, the derangement of her labor-market before as well as after the emancipation of the slaves, the excessive drain upon her able-bodied men to make up armies to sustain the conflict with the North's superior numbers, and the actual ravages of war, told heavily against her planters. Her rice, tobacco, cotton, and sugar crops fell to a mere fraction of their former amount, and neither rice nor sugar has rallied as yet from its prostration. On the other hand, the Southern planter, being shut off from the grain-supply of the North-west, began to make himself more independent by growing corn as well as cotton; and this disposition continues. The "all-cotton" plantations are in the minority now.

During this last period the acquisition of Alaska was the only extension of the national area. Alaska is twice as large as Texas, but, as the climate is too cold to ripen grain, it may be regarded as an addition to our fisheries and our forests rather than our agricultural area. Its 577,390 square miles increased the national area from 3,026,494 square miles to 3,603,884, or about twice the area of the Roman empire in the time of its greatest extent.

Three notable events give character to this period. The first was the passage of the *Homestead Law.* The Pre-emption Law of 1841 offered the public lands to actual settlers in lots of 160 acres, at $1.25 an acre. This was found insufficient to suppress the land speculation at which it was aimed. In view of the disposition of British capitalists to take up large areas of our public domain, an agitation was begun in Philadelphia by a Land-Reform League to throw open public lands to actual settlers at a trifling payment for fees. After successive defeats in the House, in the Senate, and by a veto from Pres. Buchanan, the measure became a law in 1862. A first effect was to cause the abandonment of great areas held by land speculators. They were sold to pay taxes, and passed to actual settlers. A second was to accelerate the occupation of the public domain. Since 1862 more than five million people have found homes on it, and between July 1, 1868, and June 30, 1880, there were taken up as homesteads 46,149,501 acres, chiefly in the Ohio, the Mississippi, and the Missouri valleys. This has been one of the great impulses to immigration, especially from Germany and Scandinavia. Immigration in 1862 had fallen to 89,007; next year it nearly doubled, and between 1863 and 1882, 5,980,044 immigrants have come to our shores, being an annual average of 299,022.

The tendency, always dominant in our agriculture, towards farms of medium size rather than either large or small, has been fostered by this legislation. Of course their average extent varies somewhat with climate, capabilities, access to market, and other conditions; but no law to impose specific control on the inheritance and distribution of land could have effected so admirable an adjustment of their size to individual and social needs. In thirty years 2,559,834 farms have been added to the number, and 1,348,922 in the last decade. Of the 4.008,907 farms we now have, only 4352 are less than three acres in extent, and only 28,578 contain over 1000 acres. One-fourth of the number range from 50 to 100 acres, and 42 per cent. between 100 and 500 acres. The number farmed by their owners in 1880 was 2,984,306; farmed on shares, 702,244; leased for money, 322,357. There has been a marked tendency to subdivision of large farms in the South and West, although in Dakota and some other far-West territories great districts, called "bonanza farms," have been accumulated by single owners. "All ancient legislators," says Niebuhr, "rested the result of their ordinances for virtue, civil order, and good manners on securing landed property, or at least the hereditary possession of land, to the greatest possible number of citizens." In this respect the United States has been singularly happy, and the experience of Australia shows that its good-fortune has not been due merely to the possession of an abundance of virgin soil.

The second event was the beginning of systematic *agricultural education.* As early as 1844 some efforts had been made in this direction. In a few instances chairs of agriculture had been established in the older colleges. In 1855 the first American agricultural college went into operation at Cleveland, Ohio; in 1857, the second, at Lansing, Mich. Pennsylvania and Iowa followed in 1859. But it was felt that we were lagging greatly behind Europe, and that something must be done on a larger scale. In 1862, Congress granted from the public domain to each State 30.000 acres for each Senator and Representative in Congress, "in order to promote the liberal and practical education of the industrial classes." In some States this was given to regular colleges, and used to endow an agricultural department. In others it was used to found agricultural colleges or to endow those already existing. In New York it availed for the endowment of Cornell University. Only in a few instances has it been practically wasted. But while these schools meet a real demand of the age, they cannot be said to have proved a potent element in the development of our agriculture. In 1880 there were 46 institutions aided by the national land grant, in 30 of which agriculture was taught by about a hundred professors to 1000 students. But these schools have helped in the education of many who never entered their walls, their endowment availing for the promotion of research and the diffusion of technical and scientific knowledge. Their best uses will begin when the growing density of population has compelled the American farmer to abandon happy-go-lucky modes of cultivation for those scientific methods which will make the best of the resources of the soil and will restore what has been exhausted.

Important auxiliaries to these institutions have been the Department of Agriculture, organized in 1862, and the State boards of agriculture, whose existence has helped to give dignity to the farmer's position as well as to diffuse useful knowledge. Another auxiliary has been the experiment stations which now exist in seven States—New York having four, of which two are private enterprises. It is only recently that the people have begun to realize their value. Still another educational force is our agricultural literature, which has grown rapidly in both quantity and quality, keeping pace with the new diffusion of a love of literature and science among the American people. Nearly two hundred periodicals are entirely or largely devoted to agriculture, and the conductors of many of them spare neither pains nor expense to make them readable, trustworthy, and useful. A large number of good writers are regular contributors, some of the best being educated men actively engaged in farming. One paper has an experiment station of its own, and sends its subscribers new varieties of plants and seeds which it has tested. While books and colleges have done much for us, these periodicals have done more, by reaching much larger bodies of people, and keeping them abreast with what is done, written, or said by the best authorities. The writings of Mr. A. J. Downing deserve mention.

The third event was the organization of the "Patrons of Husbandry," commonly called *Grangers*, in 1867, to enable the farmers to look after the general interests of their class, to reduce the profits of the middlemen, and to insist on fair treatment from the railroads. The policy of endowing new railroads from the public lands, begun by the Democratic party, had been continued by the Republicans. Between 1861 and 1871 seven States had received grants of 23,006,130 acres for the construction of twenty-seven roads. Besides these, direct grants had been made to railroad corporations to still greater amounts; 147,825,666 acres had been given to the three great Pacific railroads, and 11,461,600 to other corporations, making a total of grants of 314,851,596 acres, or nearly five times the area of the British islands, since 1850. (Of this, however, only a minor part has been patented, but the dilatory course pursued by Congress with reference to these grants seems to show that they are to remain open until the roads are completed and all the lands taken up.) It was not unfair to expect that these great corporations, which had received concessions and assistance from State and county governments as well, and which generally owed their very existence to the State's exercise of its right of eminent domain, would regard themselves as trustees for the public rather than as simple administrators of private property. But the farming class generally regarded their policy as unsatisfactory and unfair, and the Grangers elected majorities in several of the Western legislatures who passed what are known as Granger laws for their regulation. At first these laws were regarded by the public generally as dangerous in principle; but since the United States Supreme Court declared them constitutional, the example thus set has been followed by other classes in the Eastern States, and a very general demand has been made for the State regulation of railroads.

Besides this legislation, the Grangers secured from Congress and the State legislatures laws to protect the farming class against deception in the grade of fertilizers, fraud in patented articles, and other injuries. They promoted mutual education by conferences of farmers and their wives, at which essays on farming methods were read and discussions held. And they diminished the cost of implements, seeds, and other supplies by large purchases on the co-operative plan. They have shown their wisdom by refusing to ally themselves with any political party or to commit themselves to any view of fiscal policy.

The improvement in *farm buildings* has been necessitated by the increase and improvement of farm stock and of cereal crops. It is of recent origin, and is still far from general; but the development of taste and economy has been nowhere so well illustrated as in the modern American barn, with its basement for cattle, roots, and steam-power; its covered barnyard, manure-cellar, and silo; its main floor for horses, wagons, tools, machinery, and office; its lofts for grain, straw, and hay, and for stationary thresher and chaff-machine, the whole surmounted by shapely roofs and gables and tastefully painted. Nothing more complete, economical, convenient, and handsome is to be found in the farming of any country.

The development of our American *implements* has been traced already. The display at the Centennial Exhibition in 1876 brought the whole range of improvements before the public as never before. Their manufacture has become an important branch of industry. In 1880 there were 1943 establishments, which gave employment to 39,580 persons, used materials worth $31,531,170, and produced implements worth $68,640,486. In 1850 the product was worth $6,842,611; in 1860, $17,487,960; in 1870, $52,066,875. As noticed above, the scarcity of labor during the war gave a great impulse to the employment of such machines as the reaper and the mower. Yet in 1880 there were manufactured 167,492 cradles and 1,244,264 scythes. In the same year were built 61,064 reapers and harvesters, 72,090 mowers, and 54,920 machines which combined the two. The number of ploughs manufactured rose from 864,947 in 1870 to 1,326,123 in 1880; that of harrows, from 9150 to 127,997.

In the *drainage* of wet and cold lands there has been a great advance, which has reached beyond the Mississippi. In 1870 there was not a single tile-factory in Iowa. At present not only is the use of tiles in the fields becoming general, but they are also used beneath and at the sides of our roads, to their great improvement. The value of tile manufactured in 1880 was $1,765,428; that of drain-pipe, $2,944,239. But there still is much to be learned.

As regards *manuring*, the improvement leaves an equally great margin for the future. The number of American farmers who make an adequate use of farm manures and other accessible fertilizing materials is small, and the consequent exhaustion of the land in many quarters is shown by a diminished yield per acre. This statement excludes, of course, the virgin soils of newly-settled States; but the farmers of the older States have tardily recognized the time when their lands had exhausted their native strength and had begun to fail. (In South-eastern Pennsylvania the farmers, descendants chiefly of the original English, Welsh, and German colonists, have maintained a more careful system in tillage and manuring, and their lands have steadily risen in productive power since the first settlement; but this is exceptional.) Until recently no general attention has been paid to the value of cattle-foods as producers of manure. Thus cotton-seed meal brings a lower price than corn meal, although the amount of nitrogen, potash, and phosphoric acid in the former is between twice and three times the greater. The manufacture of artificial manures, especially the phosphates, has advanced rapidly. Their product rose in amount and value from $891,344 in 1860 to $5,815,118 in 1870 and $23,650,795 in 1880; the number of establishments from 47 to 364. It is becoming usual to mix them with gypsum or with farm manures, and that with the best results.

The growth of our cities, and the consequent development of heavy road-traffic, has created a demand for *horses* of a heavier build than America supplied. This has been met by the importation of large numbers of Percherons and Clydesdales for breeding purposes since 1868, both by the "Norman-Percheron Horse Company" and by individuals. Not less than 500 of these horses had been brought over by 1882, and the demand is still unsated. They have been most marked in Illinois, and have contributed to the general elevation of the farm horses of the regions in which they are found. The importation of Clydes and English draft horses became important in 1872, although it began earlier. Since then they have been brought over in large numbers, to the manifest improvement of our stock. The heavier colts are taken for city use, as it is thought that a horse weighing over 1300 pounds cannot be used on a farm with as much economy as a lighter horse. The old preference for a "horse of all work" is giving way to the belief in special breeds to suit special wants and particular localities. During the last thirty years horses have increased nearly threefold, reaching 10,357,981 on the farms in 1880, while about 2,000,000 were in the cities—an increase of 45 per cent. in the decade. The increase in *mules* and *asses* has been even greater, being 61 per cent. during the decade, and the number in 1880 was 1,812,932. The American mule deserves honorable mention for the services he rendered during the war in the transportation service. His endurance, patience, and strength, his capacity to eat anything and to live for days without eating, and his freedom from the disposition to stampede, rendered him indispensable to our armies.

The steady rise in the demand for short-horned *neat cattle* culminated in 1873 with the sale of the posterity of the Duchess at New York Mills, in which a cow of precarious breeding sold for $40,600, a five-months-old calf for $27,000, and 109 animals for $382,000. Many were purchased by English stock-fanciers. The effect was to show the farmer that while thoroughbred cattle were superior to native, other breeds than these costly short-horns must be employed to improve the native breed. At once the Jersey breed came into prominence, and interest in the Ayrshires revived; but these, while well suited for the dairy, could not fill the place of the short-horn cattle in the beef-market. So the best of the Herefords were procured; the Devons were talked of; and Holsteins, which were said to combine the excellences of both the short-horns and the Ayrshires, were imported freely, and at much expense and risk. At the same time, there was a desire to develop some native family or families of other breeds which should rival the Duchess. The experiment has been made, with limited success. The prices paid by foreigners for our cattle of pure breed shows that Americans have improved upon them. The Englishman else would not open his purse so wide for American short-horns, nor would the Holsteiner be surprised to learn that one of his own cows on American soil gives nine tons of milk a year, while a little Jersey cow makes twenty-five pounds of butter a week. The work of improvement has extended so far that of our forty millions of cattle there are few, except in a portion of the South and of the far West, in whose veins good blood of this recent importation does not flow; and to this has been added the better feeding and wiser care which have advanced size, quality, and value. The Texan cattle of the South-west, descended from the Spanish importations, are valuable only as breeders and for their beef, until improved by crossing with better stock. During the decade ending 1880 milch cows increased 39 per cent., and now number 12,443,593 on farms alone, New York and Pennsylvania having more than all Great Britain. Work cattle have diminished 25 per cent., and other cattle (22,500,000) have increased 50 per cent. These gains outrun the growth of the population. While the home consumption of beef is increasing decidedly (averaging over 80 pounds a head of the population each year), we have begun large exports. Behind this great increase lies the fact that the corn-crop increased in the same decade 131 per cent. An era of liberal feeding, as well as of high breeding, kind treatment, and good housing, has come through the conviction of our intelligent farmers that to try to cheat cattle is the poorest policy. To this has contributed also the intelligence and character of the American herd-boy, who gets his winter's schooling, eats at the common table, and knows that to strike a dumb beast wilfully is an act of self-degradation little better than to strike a woman.

The American *dairy* system, based on the principle of association, and aided by the cheapening of transportation and the diffusion of technical knowledge, has advanced still more rapidly as regards both the quantity and the quality of its products. The method has come into use in the Mississippi Valley, and Minnesota sends butter 1200 miles to market in New York in refrigerator-cars, at a cost of 50 to 80 cents a hundred-weight. By 1870 the cheese-factories had increased to 1313, producing nearly $17,000,000 worth of cheese. In 1880, 3932 factories produced $13,991,221 worth of cheese and $3,868,235 worth of butter. Besides these, our dairy farmers produced 530,129,755 gallons of milk, or two gallons a week for each person in the country, and 777,250,287 pounds of butter. The two were worth about $239,450,201, or more than any single crop except the corn-crop. About $13,801,189 worth was exported.

The raising of *sheep* has been greatly increased by the encouragement given by the duties on wool imposed by the tariff laws of 1861 and 1866. The former imposed specific duties on the higher grades of wool; the latter, higher specific duties on all grades. The sharp competition in dairy products has led farmers in Ohio and other places to replace their cattle with sheep. In twenty years (1862–81) the home production of wool advanced from 90,000,000 to 240,000,000 pounds, while the consumption in manufactures more than doubled (130,000,000 to 289,000,000). The clip of 1882 is estimated at 325,000,000 pounds. From 1850 to 1860 the increase in sheep was but 3½ per cent.; in 1860–70, nearly 22 per cent.; in 1870–80, 24 per cent.; the aggregate number, including ranch sheep, being 35,000,000, an increase of 13,600,000 in twenty years. About one-fourth each year are killed for food, but the mutton is somewhat inferior both in quantity and quality to that of Great Britain, as the great plenty of beef leaves little inducement to improve sheep, except with reference to their wool-producing qualities. Yet some of the largest and best carcasses are exported for British use.

The unfitness of improved English breeds of *swine* to American conditions caused a decline of eight millions in 1860–70. With the latter year began a general dissemination of native improved breeds—viz., the Chester Whites, the Poland-Chinas, the Victorias, and the Durocs—which meet all the local wants. The improvement was rapid. By 1873 the value of the swine sold in Chicago in a single year exceeded that of horses, cattle, and sheep combined by $15,000,000. In 1880 we had 47,000,000, an increase of 90 per cent. in ten years. The breeder's aim has been to produce an animal that should pack economically twenty bushels of corn into a pork-barrel, and he has spared no pains and shunned no expense in effecting this. The development of the American pig has been more rapid than that of any other domestic animal. The unsightly, gaunt wood-hog, with the speed of a race-horse, has been replaced by an animal of economic beauties and singular compactness.

The *grass* crop continues to exceed in value any other single crop except wheat and corn. The hay-crop rose from 19,083,896 tons in 1860 to 35,493,000 tons in 1879. Its value averages about $10 a ton. If to this we add the value of the pasturage and the value of the grass- and clover-seed, we get an aggregate of about $709,865,000. *Rye*, *sorghum*, *corn*, and *oats*, all have come into use as a fodder—notably so in the South and East—and the cultivation of grass in the South is extending rapidly. The new method of preserving green fodder in "silos," called *ensilage*, has been adopted from French agriculture, after so many successful tests that no room is left for doubt as to its value. The promptness of its adoption shows that the era of traditional conservatism is over for our farmers.

Were our crop of *cereals* for 1880 loaded on a continuous train of cars, 400 bushels to the car, the train would reach one and a half times round the globe. The figures are—wheat, 498,549,868 bushels; corn, 1,717,434,543 bushels; oats, 417,885,380 bushels; rye, and barley, 69,706,275 bushels; buckwheat, 14,617,535 bushels; total, 2,718,193,601 bushels. The value of the crop ($1,361,497,704) is half as great again as all the gold mined in California in the thirty-five years since gold was found there. The causes of this enormous production are found in the labor-saving machinery, which overcomes the scarcity of farm-hands; in the extension of tile-drainage; in the creation of a great home-market by the development of our manufactures; and in the cheapness of access to the Western prairies—first, through the Erie Canal, and then through competing lines of railroad. Of the wheat and corn which cross the Alleghany water-shed, the greater part is consumed in the manufacturing communities of the Eastern and Middle States. The former group of States have ceased to feed themselves; the latter, to feed their great cities. Our export of wheat rose to something more than a third of the whole crop in 1880, and fell to 30¼ per cent. in 1881. In 1867–81 the average annual exportation was 20 per cent. of an average crop of 301,671,863 bushels. In five only of the fifteen years has it been above this average.

The removal from our soil of the elements contained in this vast crop cannot but have deducted from its fertility. This was no immediate concern so long as we had a vast territory of unused and fertile land to draw upon. But the time has come for recuperative tillage, and that for the mere transformation of fresh lands into farms and homesteads has passed. There are indications that this change has begun. In 1850 the State of New York had nearly all its arable land under cultivation, and it was predicted in Europe that the decrease of cereals in the East would nearly counterbalance the increase in the West. Prof. Johnston of the University of Durham, in 1851, after visiting America, expressed the belief that our exportable wheat already was a diminishing quantity. Since that year our yield of wheat has increased 357 per cent. A later English visitor (Finlay Dun in *American Farming and Food*, 1881) says that "little more than a tenth of the available food-producing area of the continent is yet occupied and made the best of; of many fertile regions not one-twentieth is yet made profitable use of; a great deal of what is cultivated is worked very imperfectly." That our increase is not due simply to the exhaustion of virgin soils in the West is shown by the great increase of the cereal crops of 1850–80 even in New York—corn, 45 per cent.; buckwheat 40 per cent.; oats, 41 per cent.; rye, wheat, and barley, 171 per cent.; while wheat decreased but 19 per cent. And the land sown in wheat yielded as much per acre as in California, and four bushels more than in Minnesota. The decrease of wheat was due largely to the substitution of fruits and other crops in local demand for city use, while milch cows had increased 55 per cent. So in Massachusetts, the yield of land planted in wheat was as good in 1880 as in California, while the average for corn fell short of Illinois by only two bushels to the acre. But the comparison with Great Britain is unfavorable. "On a given area," says Mr. Finlay Dun, speaking for the

British farmers, "we raise double the amount of wheat, oats, barley, or potatoes, and in proportion to acreage our farms produce and feed much more than twice the amount of live-stock. . . . Taking the official statistics for nearly twenty years, the average wheat-yield of the United States is little over 12 bushels to the acre. The yield per acre of the last [six] years, exceeding former averages, are 13·9 bushels in 1877, 13·1 in 1878, 13·8 in 1879 [13·1 in 1880, 10·2 in 1881, 13·5 in 1882]. . . . In Illinois and Indiana, and also in Minnesota, well-authenticated cases occur where 40 or 50 bushels per acre have been reaped. The British wheat-yield ranges from 24 to 28 bushels." But under like conditions we shall have the same results. Whenever the need arises the means and the skill needed for the recuperation of exhausted soils are at hand.

Since the war the cultivation of *rice* has been slow in regaining its former prosperity. The dams, gates, and mills fell out of repair; the fields were overgrown with weeds; the labor had been unpopular with the slaves, and the freedmen betook themselves to other employments. The crop of 1870 was but 73,637,021 pounds. That of 1879 was 110,131,373 pounds. To effect the revival of the industry, a duty of 2½ cents a pound was placed on the import of cleaned rice at the close of the war, and since colored people have become in some cases owners of rice-lands they take a new interest in the business.

The *potato*-crop is raised with a third of the outlay required in Europe, but it is one which depends for its success upon a peculiar succession of wet and dry weather, and during this period it has been exposed to the ravages of a most prolific and voracious enemy in the Colorado potato-bug. For these reasons it has not shared in the general increase of our great staples. The crop of 1881 was a failure through prolonged drought; potatoes sold in December at 90 cents a bushel, and we paid $5,000,000 for foreign potatoes before the new crop came in. But this importation covered only one-eighth of the deficit of 70,000,000 bushels. The crop of 1882 is estimated at 167,559,570 bushels. The mastery of the enemies of the potato-plant is a problem with which science has yet to cope.

The virtual cessation of our *cotton*-supply in 1862–65 caused a great derangement in the commerce of the world, and forced the English spinners to pay attention to the long-neglected sources of supply in the East. The virtual monopoly held by our Southern States before the war has ceased, although in both quantity and quality the American product is still unsurpassed. The derangement of labor and the depression of capital kept the South from reaching again the figures of 1860 until 1871, but since 1876 the crop has passed the old limits, and rises pretty steadily every year. The increase more than keeps pace with the increased consumption in our own manufactories. In 1850 we exported over five-sixths of our crop; in 1860, 78 per cent. (retaining 509,547,229 pounds); in 1870, 66 per cent. (retaining 494,314,186 pounds); in 1881, 69 per cent. (retaining 1,012,103,200 pounds). The bounds of cotton-culture have not been reached. The State of Mississippi alone contains millions of acres which might be converted into cotton-plantations by efficient levees to exclude permanently the floods of the great river. Prof. Hilgard believes that, with slightly improved culture, that State could produce as much as is now grown in the United States; that is, 80 per cent. of the entire product of the globe. Among the improvements in method in this period have been the association of corn with cotton, and in Georgia a more careful study of the manures needed to secure abundant crops. The scarcity of laborers after the war compelled the concentration of fertilizers and skill on smaller areas. Lands which had been regarded as worn out were brought into a flourishing condition by this intensive culture, and their product doubled and trebled. Experience also has shown that the crop is less exhausting to the soil than the cereals, if the seed and stocks be returned to the soil. An important event in the history of cotton-culture was the discovery that the seed contains a valuable vegetable oil, which can be extracted without detracting from its value as food for beasts or manure for the soil. The raw seed of the crop of 1882 was worth $37,000,000, and its value was doubled by conversion into oil and meal, both of which are exported largely. The cotton-worm, thanks to the labors of Prof. Comstock, late entomologist of the U. S. Government, is now destroyed with great ease and economy.

The *tobacco*-crop of 1860 was 434,209,461 pounds; that of 1870, 262,735,341 pounds; that of 1880, 472,661,159 pounds. The severe competition of the Western wheat-growers has forced the farmer of the North to pay more attention to this crop among others. Thus, Lancaster county in Pennsylvania produced 23,946,326 pounds in 1880, whereas the whole product of the State was but 3,467,539 pounds in 1870. But instead of the old methods of exhausting culture, the use of fertilizers and a wise rotation of crops keep these lands in good condition, and even increase their fertility.

Sugar, like rice, has not reached the level of the product before the war, and there seems to be no likelihood that the American sugar-cane ever will supply more than a fraction of the hundred millions of tons which the country uses every year. The best outlook in this direction is in Florida, where the Everglades are in process of drainage by a Philadelphia company. But even these promise no more than to double the supply we get from Louisiana. The production of maple-sugar as well as that of sorghum molasses for use on the farm is declining, and no great result has been achieved by the experiments in beet-sugar. Experiments on a large scale with cornstalk-sugar have been abandoned after a great outlay. But better results are expected from the use of sorghum on a large scale and in factories. The experiments made in 1878–79 by Gen. Le Duc, Commissioner of Agriculture, with the aid of scientific assistants, pointed to this; and companies which have undertaken the business, especially in Southern New Jersey, claim to have made large profits already, and to see their way to a great extension of their operations. One of these in 1882, from 6088 tons of stalks manufactured 320,000 pounds of sugar and 51,000 gallons of molasses, worth in all $45,795. The sorghum was of the amber cane variety, and was grown on 100 acres of poor land. The cost of harvesting and manufacturing was $10,654. The seed is said to have paid the expense of growing the crop and the interest on the price of the land.

The cultivation of small fruits, berries, and vegetables in the neighborhood of our great cities, and for drying, preserving, or canning, has become an extensive and important branch of agriculture. The cultivation of the larger fruits — oranges, peaches, apples, pears, plums, quinces, and grapes—has advanced with great rapidity, 2,000,000 acres being devoted to apples alone, and 5,000,000 to fruits of all kinds. Twenty years ago the popular demand for such things was met with apples, peaches, imported oranges, and a few bananas. At present, the fruit and vegetable crops are worth half as much as the wheat-crop. The quantity of fruit now consumed in summer alone by the people of a great American city is larger than then sufficed for the whole country and for the round year. Grapes were a rarity and a delicacy, seen only in the shops of the fine confectioners or on the tables of the wealthy. "One hundred years ago," says our latest historian, "the wretched fox grape was the only kind that found its way to market, and was the luxury of the rich." "Concords," "Isabellas," and "Catawbas" are sold for a trifle at the corner stalls, as are pears of the finest varieties. Competent judges believe that the development of this taste not only contributes to the health of the people, diminishing the ravages of summer diseases, but tends to discourage the use of alcohol by supplying in an innocent and wholesome way a physical craving to which it ministers. (J. P. R. & R. E. T.)

CHAPTER II.

AGRICULTURAL GEOLOGY.

Geology is directly and intimately related to agriculture in so far as it explains the origin of soils from the mother-rocks; describes their nature and composition, their connection with subjacent and outcropping strata, or their orderly or disorderly arrangement on the underlying rocks; determines the position of good soils, and the location of mineral manures with which to enrich poor soils; discovers the elementary constituents of rocks, soils, and subsoils required by special plants under special conditions; furnishes information to aid in the drainage of soils naturally too wet, or the best method of obtaining desirable waters to moisten soils naturally too dry.

All soils are derivative, since they are produced by the gradual disintegration and decay of previously existing rocks. "The whole surface of the earth is mouldering. Every outcropping rock, whether hard or soft—granite, gneiss, greenstone, serpentine, mica, slate, conglomerate, sandstone, clay shale, coal, iron ore, limestone—is slowly but surely turning into soil under the influence of sunshine and frost. Heat expands it; cold contracts and cracks it; rain pervades it; frost pushes the particles asunder and makes room for vegetable fibres, which widen and deepen the fissures; carbonic acid in the air dissolves the crystals and rock-grains; and thus each layer in the hill has its exposed edge sooner or later turned to soil of a quality similar to the rock out of which it has been made, and of a depth proportionate to the hardness or softness, solubility or insolubility, of the layers now underneath it."

When a soil rests upon the rock from which it has been derived, it possesses more or less the composition and character of the rock, and may be called a soil of disintegration; when, however, the soil rests upon strata from which it differs widely in composition and character, or when it merely forms the covering of a considerable depth of drifted material, and has no relation to the rocks outcropping in the immediate vicinity, it may be called a soil of transport.

Soils of disintegration may be either simple or complex, dependent upon the geological structure and the extent of outcrop of individual strata. A soil overlying a rock which is the same over a wide area is generally a simple soil; that is, it is derived exclusively from one kind of rock. Such are the soils which cover the New Red Sandstone along the Atlantic seaboard, and which are found in the great Lower Silurian limestone valleys along the Appalachian range in the Eastern United States. The Lebanon and Lancaster valleys in Pennsylvania, and the Cumberland and Shenandoah valleys in Maryland and Virginia, are notable instances of the latter. Where a great variety of rocks, such as granite, limestones, sandstones, and argillaceous shales, outcrop in succession in limited areas, the soils which cover them are generally complex disintegrated soils, being made up of fine particles of each species of rock; such are the soils which cover most of the highlands as distinguished from delta-areas and valley-bottoms which have not a covering of glacial drift. It is difficult to classify all soils into simple or complex disintegrated and transported soils, as each class grades almost imperceptibly into the next. The soils which cover the plain of the Po, although they have been transported for considerable distances, may at the same time be called complex disintegrated, since they are made up from the weathered particles of the granites, limestones, dolomites, and clay slates of the Alps and Apennines. The area covered by a simple soil is dependent both upon the thickness of the rock and its geological structure. A thin stratum in a horizontal position immediately underlying the surface of a level country may occasion the occurrence of a simple soil over a wide area. Such is frequently the case in the great Alleghany bituminous coal-field, extending from the southern boundary of the State of New York south-west into the State of Alabama. A thick stratum, however, having a high and sometimes even a vertical dip, may underlie a very small surface-area, and contribute but a limited amount of material toward making up the soil which covers it. An illustration of this latter fact may be found in many of the Devonian valleys along the eastern flank of the Alleghany Mountains. The character of the disintegrated soil derived from the igneous and sedimentary strata differs as widely as the rocks themselves. Granite soils, as a class, are poor and sandy, being particularly deficient in clay on the hill-slopes. In the bottoms of the valleys and on the flatter ground they frequently contain fine clay, resulting from the decomposition of the feldspar. Trap, greenstone, and serpentine produce various soils; by themselves they are seldom more fertile than those from granite. Local conditions, however, and admixture with other soils, render them sometimes capable of high cultivation. The stratified rocks are numerous and of various characters, yet they consist generally of alternations of limestones, sandstones, and argillaceous slates and clay, or of mixtures of two or more of these substances. Some of these strata are soft and moulder quickly, and soon make a soil; while others, although formed of the same material, resist the attack of the decaying forces, and in consequence frequently underlie a barren area. Prof. James F. W. Johnston has minutely described the character and agricultural value of soils derived from the rocks (igneous and sedimentary) of Great Britain. Similar descriptions are found in the State geological reports in the United States. In these reports it will be found that the peculiar nature of the soil formed from any special rock-formation is generally the same whether the particular formation be found to outcrop in England or Pennsylvania. If, therefore, the agriculturist can obtain an accurate geological map of any country, and shall study it in connection with the facts obtained in these reports, much valuable agricultural information may be deduced.

Prof. Johnston says: "The political economist may, by a survey of the geological map of a country, pronounce with some confidence to what degree the agricultural riches of that country might by industry and skill be brought, and which districts of an entire continent are fitted by nature to maintain the most abundant population." Most geological maps, and particularly those published in the United States, of any extent of country, define only the areas underlain by the different variety of rocks, without any special differentiation of the débris covering drift-areas. The relation of the soils overspreading these areas to their mother-rock or subjacent strata is less simple than in the case of soils of disintegration; but a study of the geological phenomena connected with them removes the obscurity of their origin, and enables the agriculturist to determine not only their nature and character, but also to ascertain their capabilities of culture and the best mode of treatment to be used in order to render them most productive. These soils of transport are of a greater variety than those already considered, and cover much more extensive and unbroken areas. They consist of river-drifts—shingly gravel, sand, and alluvium; others of old lake-sites—such as peaty earths, clays, and sands; of old estuary beds—tenacious clays and silts; of wind-blown sands and sand-downs; and finally of glacial drifts—sands, shingly gravels, and stiff, bouldery clays. These numerous soils cannot be definitely classified, yet their character is easily recognized, and permits the farmer, even with an elementary knowledge of geology, to group them under one of the grand divisions. The mixed materials which produce them may form arable soils or constitute subsoils, and be overlaid by others of greater or less thickness, partly derived from their own disintegration, or by humus derived from the decay of plants resulting from a natural growth or repeated cultivations. Whatever be their origin, they are but little influenced by surrounding rocks, and must be studied independently of them. After a rocky exposure moulders away under the influence of the atmosphere, rain, and frost, the débris may be transported to areas more or less distant from the outcrop by continuous rains and occasional floods, which will not only carry the finer particles to lower levels, but will slowly move vast quantities of larger fragments to considerable distances. Where a great variety of strata outcrop in limited areas, due to high dips and numerous undulations—anticlinals and synclinals—or to a rugged topography, which exposes a number of strata even with low dips, the soil will unquestionably be one of transport, since the materials which form it have been carried from one place to another, as in the valley of the Po, already instanced. In such cases, however, where the soil may be traced to its mother-rock at no distant point, and where the transporting agents may have been local phenomena, the soil may more reasonably be called one of disintegration. These agents are operative in a greater or less degree according to the rainfall and topographical features. In many regions they are supplemented by large rivers, such as the Mississippi, Amazon, Nile, Ganges, and Indus, which have frequently overflowed their banks, depositing over the adjacent areas large masses of rich mud and sand which render their valleys so fertile. A potent agent in the transport of soil is found in the wind. The dry and fine sand and silt along the sea-coast are borne away by it and strewed over the land, forming sandhills and downs of considerable height. "Large areas on the eastern shore of the Bay of Biscay and along the coast of Jutland, both of which are exposed to high sea-winds, are covered with wind-blown sands. In the Landes the advance of the downs is estimated at 66 to 70 feet every year." The ice-sheets which are now known by geologists with certainty to have covered extended areas of the north temperate zone during the Glacial period, in moving to the south have carried before them large quantities of rock-fragments, sand, and gravel, which have been *dumped* along their edges as they gradually receded, while the ice melted during the warmer climate of the subsequent epochs. As the ice disappeared, the material which it dropped would be spread over the country by the resulting water. The northern parts of North America, Europe, and Asia are covered in many large districts by soils which have been transported by glaciers.

A good soil, according to Prof. Ansted, should be composed of nearly equal parts of the three earths—sand, clay, and lime; it should contain a certain quantity of decomposing vegetable and animal matter; it should imbibe moisture and give it back to the air without much difficulty; it should have depth sufficient to permit the roots of the plants to sink and extend without coming to rock, to water, or to some injurious earth; the subsoil should be moderately porous, but not too much so; and in case of need the subsoil should be able to improve the soil by admixture with it. It is obvious that soils which have such a varied origin and composition cannot be alike culturable and fertile. Hence, to correct the one by admixture with another, to render this more friable and that more compact, to improve this one by drainage and that by manuring, is essential to successful farming. Sandy soils, though active, soon become exhausted, and are apt to be parched in dry seasons, while, on the other hand, clayey soils, though containing in abundance all the elements for plant-growth, in wet seasons become waterlogged and unworkable. To obtain soils for proper admixture necessitates a geological knowledge of the district. The improvement of soils by this means is of a permanent character, unlike the application of soluble manures, which has to be constantly repeated.

According to Prof. Johnston, the methods of improving soils by manures are dependent upon the following principles: First, that plants obtain from a fertile soil a variable proportion of their organic food—of their nitrogen probably the greatest part. Secondly, that they require inorganic food of various kinds, and that they procure this partly from the soil. Thirdly that different species of plants require a special supply of different kinds of inorganic food, or of the same kinds in different proportions. Fourthly, that of these inorganic substances, one soil may abound or be deficient in one, and another soil in another; and that, therefore, this or that plant will prefer to grow on the one or the other accordingly. Mineral manures include those mineral substances which may be used for soil-enrichment, and which are obtained directly from the earth by simple digging, quarrying, or mining. The variety of these manures is very great; they are carbonaceous, saline, or calcareous. Peat, although strictly of vegetable origin, is generally considered one of the important mineral manures. When dug up and exposed to the weather it crumbles into powder. Either alone or mixed with lime it greatly improves stiff loams and clays. When mixed with barnyard manure it increases its efficiency by absorbing and storing the ammonia which is given off, and which would otherwise be lost during fermentation. Charred peat is also an excellent absorbent of the liquids of the barnyard. Coal-dust or culm, coal-ashes, and soot have been found beneficial for some soils. The two former, spread on cold, stiff clays, cut them, rendering the soil more friable. Among the calcareous manures the most important are lime and limestone, marls and marly soils. When soils in a dry condition contain not less than 5 per cent. or more than 20 per cent. by weight of lime, they may be called marly. When a soil has some of the characteristics of marl, but does not contain as much as 5 per cent. of lime, it may be called a sandy, loamy, or clayey-marl soil. If there be more than 20 per cent. of lime in the soil, it becomes a true calcareous marl. This classification, which has been proposed by Johnston, is not adapted to the American marls. Many of the rich fertilizing marls from New Jersey contain as low as 1 per cent. of lime, their value depending upon variable proportions of phosphoric, sulphuric, and silicic acid, potash, magnesia, alumina, and iron. The marl-beds of New Jersey all belong to the Cretaceous formation, and are regularly stratified; the grouping of this formation shows the relative positions of the marls:

Cretaceous Formation of New Jersey [*by Prof. George H. Cook*].

Division.	Subdivision.
Upper marl-bed.......	Blue marl, Ash marl, Green marl.
Yellow sand...............	Yellow sand.
Middle marl-bed......	Yellow limestone and lime-sand, Shell-layers, Green marl, Chocolate marl.
Red sand.................	Indurated green earth, Red sand, Dark micaceous clay.
Lower marl-bed.......	Marl and clay, Blue shell marl, Sand marl.
Clay marls..............	Laminated sands, Clayey green sand.
Plastic clays............	Lignite, Potter's clays, Fire-clays.

These strata extend across the State from Raritan Bay, south of New York, south-west to the Delaware River, extending from Trenton to Salem.

The blue shell marl constitutes the principal part of the lower bed. It consists of green sand mixed with fine earth, much of which is carbonate of lime, and is about 16 feet thick. The green marl layer of the middle bed is almost pure green sand, 15 feet thick. The shell layer above it varies from 4 to 7 feet thick. When unchanged it is white, with fossil sea-shells; in the lower two-thirds they consist almost entirely of the *Pycnodonta vesicularis*, and in the upper third of the

Terebratula harlani. This remarkable bed is developed along the outcrop for 100 miles. The top layer of the middle bed is a mass of crumbled corals, sea-eggs, and other calcareous matters, with a small percentage of quartzose sand and scattered grains of green sand. In Salem county it measures 25 feet thick. The upper marl-bed is about 37 feet thick, and is rated as less valuable than the lower beds. The marl is generally dug with spades, or if compact is loosened with grubbing-hoes; it crumbles readily upon exposure to the weather, and is handled as sand. Prof. Cook concludes that—(1) The most valuable marls, and those which will best pay the cost of long transportation, are those which contain the largest percentage of phosphoric acid; (2) the most durable marls are those containing most carbonate of lime; (3) greensands containing but little of either phosphoric acid or carbonate of lime become active fertilizers when composted with quicklime; (4) marls which are acid and burning from containing sulphate of iron can be rendered mild and useful as fertilizers by composting with lime; (5) forage crops, grass, clover, etc., are particularly improved by the use of marls. By spreading from 100 to 200 bushels of green marl over a single acre the crop is generally doubled, and sometimes quadrupled.

The marl- or phosphate-beds of South Carolina have produced a valuable mineral fertilizer. This formation is of Post Pliocene age, and consists of extensive deposits of fine clay and sand containing incredible numbers of scales, teeth, and bones of fishes. The solid parts of these animals have turned into phosphates, together with other organisms of the vicinity. The bed is over thirty miles long, and is widest in the vicinity of Charleston. The value of these marls is almost entirely dependent upon the amount of the phosphate of lime which they contain.

A crystallized variety of the phosphate of lime under the name of APATITE (*q. v.*) is frequently obtained from veins in the older rocks. A more massive variety, known as *phosphorite*, is more abundantly found.

In the greensand and crag formations of England and the greensands of France phosphatic nodules, concretions, round bones, and coprolites, or fossil excrements, are found in beds from a few inches to several feet thick, and when moderately pure contain 50 per cent. of phosphate of lime.

Lime, which has been called the "basis of all good husbandry," is probably the most valuable, and certainly the most available and extensively used, of all mineral manures. The value of lime as a fertilizer, and of other mineral manures, depends much upon their composition; in this the agriculturist must seek the aid of the chemist. The application of lime increases the fertility of soils in which it does not abound, and enriches moist soils and those which contain inert vegetable matter. The value of many animal manures is greatly increased by the use of lime.

In addition to these mineral manures, a number of saline substances have recently been employed with wonderful advantage. Among these may be mentioned sulphate of ammonia, carbonates, silicates, and nitrates of potash and soda, common salt, and sulphate of magnesia.

The drainage and irrigation of soils are rendered necessary by the superabundance or scarcity of water, which in turn is directly dependent upon the geological structure of the rocks, of any area specially considered.

In speaking of the bearing of geology upon agriculture and the importance of good soils, Prof. Lesley says: "Good soil has always been essential to civilization. The best soil is that of river-deltas, and on these have sprung up all the mighty empires of history. The next best soil is that which covers the limestone rocks. Where continents are crossed by belts of limestone soil, population is dense and intelligent and the map is studded with villages and large towns. France became the most powerful and enlightened country of continental Europe because one-third of its area is an unbroken plain of limestone, with Paris in the centre, and another third of its area consists of almost unbroken delta-deposits, stretching from Marseilles to Bordeaux. At first there was a double France. When its northern and southern halves were united under one government, then united France dominated Europe. Our Western prairies have virtually a delta soil, and the men of the prairie are becoming the rulers of the republic. Southern Russia is floored with the same black earth, of apparently the same age and of similar origin. Northern India is one immense delta, and on this unbroken plain have lived a succession of empires. At present it supports a population three times as great as that of France. North-eastern China is an immense delta, and its rulers have firmly held their power for four centuries over all the other provinces of the empire. All kinds of soils, even the poorest, can at present be permanently occupied; populations need not be crowded into the most fertile geological belts; railroads and good roads sow fertility everywhere; and the democratic principle of the greatest good to the greatest number, and more good for all, may be realized."

Works to be consulted: Johnston's *Lectures on the Application of Chemistry and Geology to Agriculture;* Page's *Economic Geology;* Burns's *Soils, Manures, and Crops;* Burat's *Géologie appliquée;* Liebig's *Agricultural Chemistry.* Reports: *Second Geological Survey of Pennsylvania;* Cook's *Geology of New Jersey;* reports of the Pennsylvania and New York State Boards of Agriculture. (C. A. A.)

CHAPTER III.

IMPLEMENTS AND MACHINES.

The development in the efficiency of agricultural implements and machinery within the last quarter of a century has been without a parallel in the history of the earth's tillage. As a single example, it is estimated that in the United States the mower and reaper in the season of the harvest now saves the labor of 2,000,000 men. In this article, in which it is attempted only to review hastily the principal improvements made on the imperfect tools of former years, and to describe the most valuable labor-saving appliances of the present time, they will be taken up in the order in which they are used during the successive stages of work in the season, beginning with (1) implements of tillage; (2) implements for planting and sowing; (3) implements for cultivation; (4) machines for harvesting crops; (5) thrashers and separators; (6) steam-, water-, and wind-powers.

(1.) *Implements for Tillage.*

The Plough.—This implement, although introduced into use thousands of years ago, has never yet been superseded; its simplicity has maintained its position. Although made of several parts, yet these are firmly bolted together and made into a compact implement capable of receiving without harm the sudden blows from stones in the soil or resisting the concussion of other obstructions. Many attempts have been made to perform the work of the plough with more complex contrivances and rotary spaders, but they have been so easily deranged or bent by use in hard soils that in all cases they have been thrown aside, except in sandy or alluvial districts which are free from stones.

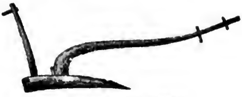


FIG. 1.—Kooloo Plough.

The ploughs of the ancients and of partly civilized modern peoples will not compare for a moment with the best improved steel or chilled-iron ploughs made in this country at the present time. The accompanying figures represent some of the rude forms. Fig. 1 is the Kooloo plough, still used in some parts of India; fig. 2 is the Moorish plough; fig. 3, the Baden plough, is a great improvement on the two previous forms, but is gradually giving way to better implements. The "bull plough," generally in use in this country in the early part of the present century, is still remembered by old farmers. It had a wooden mouldboard with an iron share, and frequent journeys were made by the farmers to the neighboring blacksmith to sharpen the points worn dull by use. Jethro Wood, the inventor of the cast-iron plough, was the first to give it a form for general introduction, and the shape of his mouldboard has been scarcely improved in the best formed ploughs of the present time, as represented in fig. 4.

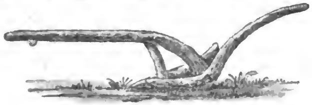


FIG. 2.—Moorish Plough.

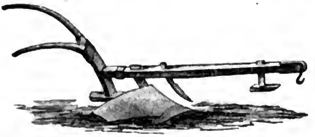


FIG. 3.—Baden Plough.

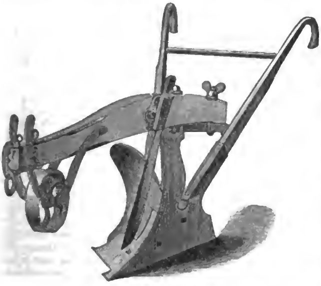


FIG. 4.—Modern Plough.

The cast-iron plough, when first manufactured for sale, was placed in market with the rough surface to the mouldboard as it came from the founder's moulds, and days were required in adhesive soils, by frequent scouring with the hand while at work in the field, to give it a bright surface and to cause the furrow-slice to glide freely over its face. A great advance was subsequently made by using steel for the mouldboard, causing less adhesion of the soil to its surface. More recently, the chilling process is applied to the whole surface of the mouldboard, and the late improvements in this process render the metal so hard that a file will scarcely make any impression on it, while full strength is secured.

The efficiency and durability of the improved ploughs, as now manufactured in numbers counted by hundreds of thousands in the United States, are worth annually to the farming interests many millions of dollars.

Construction of Ploughs.—There are two important requisites to every good plough: (1) It must have a light draught for the amount of work it performs, and must run with steadiness and at uniform depth; (2) the character of the work must be as perfect as practicable in inverting the sod, burying vegetable growth, and pulverizing the soil as it is thrown over, instead of laying it in a heavy, solid mass. Under the first requisite the two principal sources of resistance must be considered—namely, the friction on the bottom and sides, and the resistance of the earth against the cutting edge. Experiments in this country and in England have shown that the friction is about 35 per cent. of the whole force required to draw the plough, while about 55 per cent., or more than one-half, is consumed in cutting the earth or separating the furrow-slice from the solid land. The remaining 10 per cent. is required for lifting the furrow-slice and laying it over. These figures—which, however, vary with different soils—show that it is most important to maintain a sharp cutting edge to the point or share. Hence this edge is made of the hardest material, chilled iron being found best. Where stones or other obstructions exist in the soil, or where it is so hard as to offer much resistance, it is necessary that the line of the cutting edge form an acute angle with the land-side, making a sharp wedge for more freely crowding these obstructions aside—for the same reason that a sharp boat runs most easily through water. In such stony or gravelly land the tenacity of the soil to be overcome is not great, and a sharp edge, like that of a knife, is less essential. But where the soil is filled with fibrous roots, as on the Western prairies, a keen edge to cut them is of the greatest importance, and hence the frequent use of the rasp or file in the field to maintain it.

The form of the mouldboard may vary with its purposes. On a heavy or hard soil it should have such a twist as to produce pulverization in the act of inversion. This part of the plough may have an almost endless variety of forms, the best of which may be determined by actual trial in different soils—ease of draught and good work being the two essentials.

The Operation of Ploughing.—An expert ploughman will attach the team as near to the plough as practicable for them to turn the corners without the whiffletrees striking their heels. The nearer the horses are to the plough, the less the friction is on the sole of it. A pair of horses attached as leaders perform much less effective work than the other two nearest to it; and three horses abreast are nearly as effective as four geared in pairs. By adjusting the traces, and the clevis at the end of the beam, the ploughman regulates both the depth and the width of the furrow. If the furrow-slice is too narrow for its depth, it will be crowded aside without turning over. A variation of an inch or two in width or depth will make the difference between good and bad ploughing. A well-adjusted plough will run so steadily as often to go some distance without being held. On the contrary, when ploughing in good land requires constant effort on the part of the ploughman, it shows that something is wrong in the

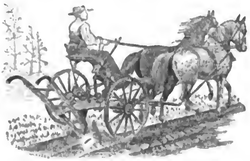


FIG. 5.—Sulky Plough.

adjustment of the plough, or possibly the fault may be partly in the implement itself.

Sulky Ploughs.—These implements have two considerable advantages over the common plough—in the ease to the ploughman, and in the reduced friction by the wheels bearing the weight of the plough and of the furrow-slice, instead of dragging this weight on the sole of the plough in the furrow. By the use of levers the ploughman controls the depth of the furrow and the width of the slice. An example of these, the Buckeye sulky plough, is represented in fig. 5. The wheels and attachments may be used for any plough, turning the furrow either to the right or to the left, and two or three horses may be used.

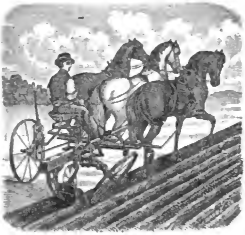


FIG. 6.—Casaday Sulky Plough.

The Casaday sulky plough (fig. 6) has a distinct peculiarity in omitting altogether the land-side of the plough, an inclined wheel pressing against the side of the furrow and holding the plough firmly in position as it passes onward. It will be seen that the friction on the sole of the plough and that against the land are both obviated by the two wheels which bear the weight; and the furrow-slice is maintained of a perfectly uniform width without care on the part of the driver.

Ease to the ploughman and lightness of draught have already been stated as the merits of sulky ploughs. The drawbacks are increased cost—more than double the cost of ploughs alone—and their more cumbersome shape. While, therefore, they have proved advantageous on large farms, and particularly on the broad plains of the West, they are less valuable on farms of moderate or small size or where the land is uneven or contains many obstructions.

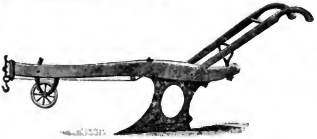


FIG. 7.—Common Subsoil Plough.

Subsoil Ploughs.—The common plough inverts and pulverizes the soil down to a depth of six or eight inches, and by repeating the operation year after year the pressure of the sole of the plough in the bottom of the furrow gradually forms a hard crust, which is detrimental to the extension of the roots of plants below that depth, and prevents the ascent of the moisture from the earth below. When heavy rains fall the shallow bed of mellow earth is soaked and flooded with the excess of water. To prevent these difficulties the subsoil plough is used. It is made in such a form as to loosen the subsoil several inches deeper by running in the bottom of the furrow made with the common plough, without throwing the soil to the surface. The mellow bed of earth thus made deeper absorbs and holds water like a sponge, and gives it off in time of drought. It allows a deeper range for the roots. Root-crops in dry seasons have sometimes been doubled by its use.

Subsoil ploughing is of little value on light and porous soils with loose subsoils. It is specially beneficial for firm soils which have an impervious crust below. Although the practice is an old one, there are important requisites in the construction of the implement not always understood. Fig. 7 represents a common form, the wedge-form share at the base for loosening up the hard subsoil being supported by a double shank connected with the beam. Sometimes, instead of the double shank, there is a single broad one, which works well in non-adhesive earth, but in strong clay soils in a moist condition the broad face of the shank adheres to the earth, greatly increasing the draught, and sometimes stopping the team altogether. In such soils, to reduce the friction to the lowest practicable amount, the shank should be made as narrow as possible, like that represented in fig. 8, the required strength being given by braces. When broad shanks have been used in clay soils, the operation has been so difficult that subsoil ploughing has been pronounced impracticable and a failure.

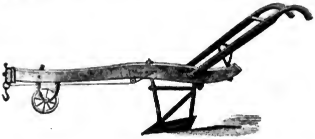


FIG. 8.

Trench-ploughing should not be confounded with subsoiling. The former makes a deep furrow, but throws the soil to the surface; the latter merely loosens the soil, leaving it below. Trench-ploughing is valuable where the subsoil possesses fertilizing elements which are valuable when mixed with the earth at the surface. It is performed either with a common plough, or with a plough of similar form but admitting of greater depth of work. The double Michigan is one of the best forms of the trench plough. It often happens that the subsoil plough may perform a useful office by loosening the earth to precede the trench plough and give it greater depth.

As the main object in using the subsoil plough is to loosen the earth without lifting it, the share which performs the loosening must be in the form of a wedge. If the subsoil is hard and not adhesive, the wedge should be quite acute, so as to enter the hard material with least resistance; but if the subsoil is stony, the wedge should be shorter. Subsoil ploughs are to be selected, therefore, for their adaptation to the different soils in which they are used.

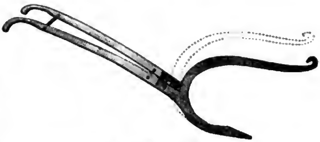


FIG. 9.—Ditching Plough.

The *ditching plough* is a useful implement, a modification substantially of the subsoil plough. After trials of various forms of complicated machinery for ditching, the experience thus gained favors the use of simple ploughs of the kind shown in figs. 9, 10. These can be made to go down, by successive passings, to a depth of three feet, loosening the hard subsoil and obviating the use of the pick. The loosened earth is thrown out by hand. Under good management and favorable circumstances, it reduces the expense of cutting the ditch to less than one-half what it would cost by hand-labor.

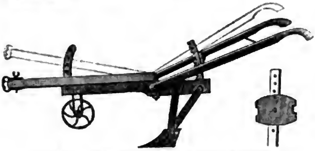


Fig. 10.—Another form of Ditching Plough.

Appendages to the Plough.—The simpler the plough and the fewer its appendages, the better, provided it runs equally well. Sometimes, however, the simpler additions give important advantages. Among these is the wheel for regulating the depth, placed under the forward end of the beam, as shown in fig. 10. Accurate experiments have shown that the wheel not only gives better ploughing with moderate skill, but also slightly reduces the draught. It gives uniformity to the depth of the furrow and equalizes the labor of the team. The wheel should sustain little pressure, that the line of draught may be nearly straight.

Another useful appendage where a heavy growth of vegetable matter is to be turned under is the chain and weed-hook. Crops of clover, rye, or other green manures may be completely and easily buried by attaching a large chain to connect the whiffletree to the plough in such a manner as to gather and sweep under the entire growth in front of the furrow-slice. The same result is more neatly performed with the weed-hook, which is an iron rod attached to the plough-beam and extending backward in an oblique direction just above the furrow-slice, so as to lay the vegetable growth flat just before it is turned under.

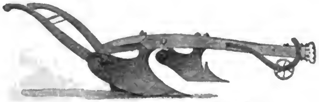


Fig. 11.—Double Michigan Plough.

The Double Michigan Plough.—A plough under this name was introduced more than thirty years ago, and proved of great efficiency for certain purposes. It consisted of a large common plough, with a smaller plough attached to the beam forward of the large one, about one-half or one-third,its size (fig. 11). The plough was set deep enough for the small plough to cut about three or four inches deep, so that the surface was inverted with this smaller plough and thrown into the bottom of the previous furrow. The large plough, following, turned up the under soil and threw its heavy furrow-slice over on the previous small furrow-slice, and buried it deeply under. This plough was especially valuable for inverting grass-sod, the smaller plough paring off the surface, and the larger one burying the grass so deep that it could not sprout up to the surface. The grass-field thus ploughed presented a deep, mellow surface, with none of the common appearance of inverted sod. An objection to this plough was the force required to draw it, which was at least double that for the common plough, the larger ones usually running nearly or quite a foot deep. The form has been modified, therefore, by making the smaller or paring plough of less size, now termed a skim plough or skim coulter, the whole plough being known as a "jointer." Fig. 12 represents the Wiand plough, made in this form.

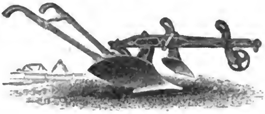


Fig. 12.—Wiand Plough.

Reversible Ploughs.—A form of the plough by which the share and mouldboard may be readily changed from one side to the other, or to the left or to the right, termed also the swivel or side-hill plough, is specially adapted to ploughing the sloping sides of hills by changing the mouldboard at the beginning of each furrow, and turning every furrow down hill. These ploughs may be used also on level land, obviating the making of any dead furrow. Among the various modifications, one of the best is represented by fig. 13, known as the Oneonta clipper. Like other side-hill ploughs, the change in the mouldboard is effected by swinging it around and under the implement. The hook or latch connected with the mouldboard is operated by a tread of the foot of the ploughman, turning it for the next furrow without taking his hands from the handles. It is so arranged that the ploughman may walk with both feet in the furrow. Each change of the mouldboard and share brings the coulter into position. Other forms of the swivel plough are simpler in construction, but require more attention on the part of the ploughman in changing at the ends of the furrows.

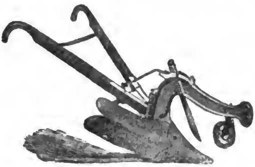


Fig. 13.—Oneonta Clipper.

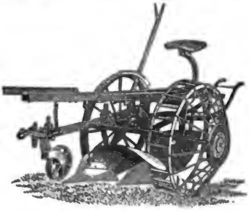


Fig. 14.—Plough and Pulverizer.

Sackett Plough and Pulverizer.—This implement for combining the operations of ploughing and fine pulverization has been recently invented and brought into use (fig. 14). Like the original double Michigan and the later jointer plough, it has a smaller forward plough or mouldboard, which removes a few inches of the top soil, which is pressed down or crushed by the open wheel into the bottom of the previous furrow.

This is followed by the main plough, the furrow-slice from which is not turned into the previous furrow, but on the interior of the above-mentioned wheel of open iron framework, about 40 inches in diameter, which follows closely after the main plough and receives its turning soil. This fresh soil is carried around by the wheel and pulverized against its iron teeth and cross-bars, dropping out upon the buried sod in a finely-pulverized condition, without being packed by the tread of the team. Thus, at a single operation, the soil is inverted, the weeds and grass are thrown under, and the furrow-slice is finely divided, without being trodden as with the harrow. Arrangements are provided for regulating the depth or width of the furrow and for conveying the plough from one place to another; a seat may be provided for the driver, as in the sulky plough. A three-horse team is required to make thorough and satisfactory work in the strong soils where it is particularly needed. The chief drawback to its general introduction is its somewhat complex construction, and consequent expense.

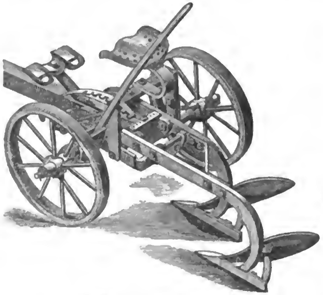


FIG. 15.—Gang Plough.

The gang plough (fig. 15) consists of two or more small ploughs placed side by side, supported by wheels and gauged for depth. Its advantages are more rapid work and less labor in holding where moderate depth only is needed.

Implements for Pulverization.—The great improvements made in implements for pulverizing the soil are hardly appreciated in their importance and in their beneficial effects. Imperfect tillage leaves the land full of hard lumps or encumbered with a crust. Delicate fibrous roots cannot easily penetrate such soils, or obtain from them moisture and nutriment. The attempt to grow crops on such land is like undertaking to feed persons on unground corn or trying to raise garden vegetables in a heap of stones and gravel. On the other hand, when soils are finely pulverized the roots extend freely, and moisture is held as in a sponge and given out as needed. For this reason a mellow soil is one of the best securities against the effects of drought. Another bad effect of hard soils, for winter grain especially, is observed when they are surcharged with water and are then frozen hard, by which the roots are broken or thrown out, producing the well-known loss by "winter-killing." But strong plants grown on a fine deep soil are not subjected to the extremes of drought, flood, and freezing, and remain unharmed.

A distinct series of experiments in proof of the value of fine cultivation was reported in the *Country Gentleman* by Waldo F. Brown of Ohio in 1881. He says: "I had been taught when a boy that it was good to leave a wheat-field lumpy, so that the action of the sun and frost might crumble the clods and protect the roots of the wheat. At this time we had for some years had poor crops, and many farmers were really discouraged and ready to give up wheat-growing; but in 1876 a young farmer who lived near me determined to put in only two acres, doing the work as well as possible, and if the crop failed he would stop sowing wheat. He ploughed early, harrowed, dragged, and rolled until his land was like a garden; and the consequence was, he obtained 58 bushels of excellent wheat from the two acres. The next year he sowed seven acres, then twelve, twenty, and thirty, still putting his land in the same excellent condition, and no crop averaged less than 25 bushels per acre. I practised the same plan with uniform success and great profit; and now my rule is, on clay soils, *unlock the fertility by thorough pulverization.* I have thoroughly ascertained that 'tillage is manure.'" An Ohio wheat-grower also says: "The farmer will find that thorough cultivation is manure, and that each of his teams, by going several times over the ground, has earned ten dollars each day they were employed."

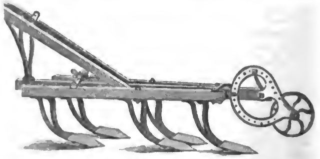


FIG. 16.—Cultivator, good form.

In the construction of all implements for pulverizing the soil, and especially those which are to be used in firm or hard ground, a form for the cutting portion should be adopted which will easily loosen up the hard soil. A cultivator, for instance, with nearly vertical teeth, the broad faces of which move squarely against the resisting earth, will be drawn with great labor to the team. But if the form is that of an acute angle, the teeth entering the soil horizontally and gradually raising the broken parts, the draught will be comparatively easy. Fig. 16 represents the teeth of a cultivator fitted for easy draught, while fig. 17 shows the objectionable form, requiring great force to move them through the soil.

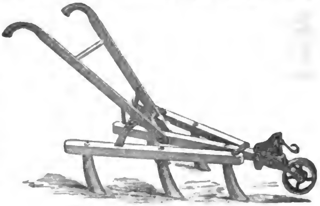


FIG. 17.—Cultivator, bad form.

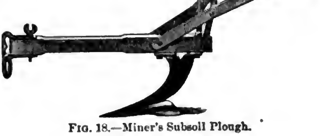


FIG. 18.—Miner's Subsoil Plough.

On a similar principle Miner's subsoil plough is made, the long, sharp portion of the share causing an easy entrance into hard ground, and gradually lifting up the loosened portions.

Harrows and Pulverizers.—The common square-tooth harrows, with the teeth set at right angles to the wooden frame, were universally employed by our farmers twenty-five years ago. As the teeth were drawn square against the soil, a heavy draught was required in using them, and for the same reason they became quickly clogged if the ground contained fibrous rubbish, as in fig. 19. They were imperfect pulverizers, pushing clods and lumps aside with the teeth, instead of reducing them to powder. Two great improvements were made—one in Shares's, and the other in the disc, harrow. Shares's harrow was patented in 1857, and its introduction marked an era in the improvement of harrows. Its form consisted in the shape of its teeth (fig. 20), which are broad, thin blades of iron, inclining backward, so as to prevent clogging with roots, weeds, or other rubbish, or from being caught by any obstructions, and facilitating easy draught. At the same time they gave a side motion to the earth like the mouldboard of a plough, and turned and pulverized it. The teeth, from their peculiar form, were well fitted for reducing the surface of inverted grass-sod by riding over and slicing up the soil without tearing up the inverted grass.

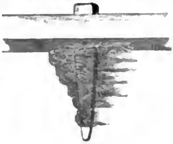


Fig. 19.—Clogged Harrow-tooth.

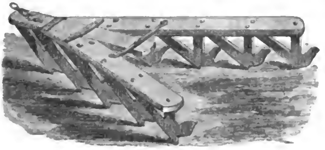


Fig. 20.—Shares's Harrow.

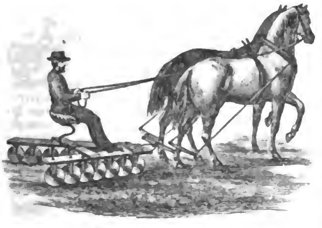


Fig. 21.—Disc Harrow.

Disc Harrows.—The disc or Nishwitz harrow (fig. 21), of which there are various modifications made by different manufacturers, consists essentially of circular thin plates of steel turning on a common axle and set slightly oblique to the line of draught. The discs cut into the soil, and in turning cast it slightly sidewise. These discs cut through the soil with a rolling motion and with reduced friction; they are not caught or impeded by obstructions.

One of the best modifications of the disc harrow is known as the Randall harrow. It has twelve rolling plate wheels with sharp edges. They are made slightly concave, to assist in pulverizing or crumbling the slices of soil cut off by the wheels, and by their oblique roll through the soil become self-sharpening. They form the surface into small ridges not quite half a foot in width. The wheels are placed in two gangs of six each, all of which are fixed and move together, instead of each wheel being separate, as in the original Nishwitz harrow.

The Smoothing Harrow.—The smoothing harrow is distinguished from all others by its many round steel teeth (usually about double the number used in common harrows), and by their backward slant at an angle of about 40°. Its advantages are—the fine pulverization of the surface produced by its many sloping teeth, which cut downward through clods of earth, instead of pushing them forward and aside, and its never becoming clogged with rubbish. Its uses are the following: harrowing wheat and other sowed grain by passing broadly over the whole surface, pulverizing the crusted soil, and grinding and destroying minute weeds, but passing without harm over the larger and stronger wheat-plants; the same treatment is applied to young corn, destroying young weeds as they appear at the surface, but passing over the larger corn-plants without injury; and it is an efficient pulverizer of manure which has been spread on the surface of ploughed fields or as a top-dressing of meadows. It is not adapted to the cultivation of beets and turnips.

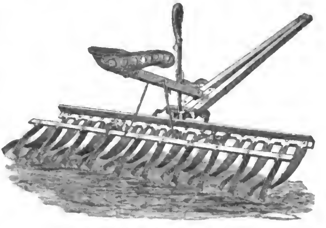


Fig. 22.—Acme Harrow.

The Acme Harrow.—An implement of great value, recently introduced, is the Acme harrow. Like Shares's harrow, it is furnished with broad cutting blades, which are made of steel, and are set sloping backward, with a partial twist like that of the mouldboard of a plough. The sharp edges of the teeth, their oblique entrance to the soil, and the turning and side motion they impart, give this implement the combined advantages of ease of draught and thorough pulverization of the soil. Each harrow has two rows of curved teeth or coulters, throwing the soil both right and left, besides a row of steel crushing-spurs. These harrows are usually made for two horses, cutting five feet wide, but they are likewise made for three horses, seven feet wide, and for four horses, twelve feet wide.

The Spring-tooth Harrow.—Harrows with a scroll spring, or with flat curved teeth forming nearly a circle, are of comparatively recent introduction. Within a few years they have been rapidly brought into use in the different States, and inventors have devised many forms for the construction of the harrows which are furnished with these teeth. The advantages which they possess appear to be the following: (1) the vibratory motion, causing them to throw off any collected rubbish and to shake and pulverize the earth which they take up; (2) the form of the teeth, the points striking forward at an acute angle, and entering the earth with less resistance than if drawn with a square face against the soil; and (3) their elasticity, giving more equal draught than the abrupt resistance of stiff teeth. Among the many modifications, some have wheels and others are without them, and some have the spring teeth attached to single-horse cultivators. The modifications fit them for various purposes and conditions of soil. In the Whipple harrow the teeth are set so as to run with their sharp edges obliquely through the soil, giving to each something of the character of the mouldboard of a plough. The elasticity of the spring is increased and its firmness retained by making it in two portions, with an interposed short wood beam between them; or, in other words, each spring is attached to a short beam, and this again to the frame of the harrow by another short and stiff spring.

Monroe's Rotary Harrow is made of timbers radiating from a common centre and forming a circle like that of a wheel. It is placed horizontally, and is drawn by means of a beam attached to the hub with a king-bolt. A weight pressing on one side causes the teeth to enter the soil deeper on that side, producing sufficient resistance to cause the harrow to revolve continually in its horizontal position on a vertical axis as it is drawn forward. This revolving motion prevents all clogging with rubbish, and new sides of the teeth are successively brought towards the resisting soil.

The Geddes Harrow.—This harrow is particularly adapted to rough or uneven land, or to such ground as is encumbered with obstructions. It consists of two frames, each like the letter V, with the acute points forward and one before the other. The teeth being some distance behind the point of draught, a steady motion is imparted to the harrow and a uniform amount of draught to the team. The two parts are separated by a hinge-rod running in the direction of the line of draught, which adapts the harrow to uneven ground, and enables one side or the other to be lifted readily for the discharge of weeds or rubbish. The hinge allows the harrow to be doubled back and carried in a wagon. Attaching the draught to the extreme forward end, with short traces to the horse, would tend to raise it in the middle, a difficulty which is readily obviated by attaching a chain a little back of the point on each side, making a centre loop for the draught.

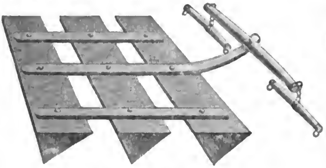


FIG. 23.—Clod-Crusher.

Clod-Crushers.—On clayey soil, when made too wet, and afterwards drying, the surface is apt to become encumbered with clods, which are not favorable to finished cultivation. Clod-crushers of various forms have been employed to reduce the clods to powder. The simplest consists of a heavy log, like half a roller, set stiff in a frame, and dragged sidewise over the surface, grinding and pulverizing the lumpy soil. A better form, shown in fig. 23, consists of a succession of these crushers framed together, each one performing the office of grinding. Crosskill's clod-crusher has been much used in England, and to some extent in this country, and consists of a number of circular cast-iron discs revolving loosely and separately on an axle. The outer circumference is formed into teeth, which crush and grind the clods. Clod-crushers must be used only when the ground is sufficiently dry to separate into powder. If it were moist, they would do more harm than good. They are less necessary when thorough tile-draining is adopted, which prevents the formation of clods, and are likely to be superseded by various forms of improved harrows.

(2.) *Implements for Planting and Sowing.*

By the use of machines for depositing seed in the prepared soil important advantages are gained. When used instead of broadcast sowing by hand, they place the seed more evenly and at more uniform depth. A smaller quantity of seed is required, as every grain has an equal chance, and the crop is heavier. For sowing in drills or rows the saving of labor is great, dropping from the hand and covering with the hoe being slow and laborious, while machines do the work with many times greater rapidity.

Grain-Drills.—A gradual and important change has taken place in the construction of grain-drills since they were first introduced into use. At first the seed was discharged by a revolving cylinder, on the surface of which cavities were made for taking from the hopper measured portions of the grain and casting them down through tubes into the soil below, the depth of which below the surface was sufficient to allow the mellow soil to fall and cover the seed. This mode of distributing the seed did not prove satisfactory, and the next contrivance was to provide circular revolving brushes on a cylinder, passing the seed through holes in the bottom of the long hopper. This expedient proved also imperfect, and the brushes were liable to wear out. The best grain-drills now made are furnished with cast-iron dischargers, which will last a lifetime, and will distribute the seed constantly and uniformly on level and on side-hill land, and they are therefore termed "forced" dischargers. The rapidity of discharge is perfectly controlled by means of contrivances variously adopted by different manufacturers.

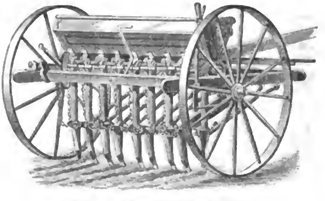


FIG. 24.—Champion Grain-Drill.

There are many grain-drills now made in different States performing the work in the best manner, and all having much similarity in external appearance. Among them is that represented in fig. 24. When desired, it is furnished with a fertilizer attachment, spring hoes, corn-planter, or forced grass-seeder. It will sow phosphate or guano, whether dry or damp. The corn-planting apparatus will sow three drills at a time. The tubes of most drills deposit the seed in a narrow trench, and to obviate this objection Shreiner's broad grain-drill shovel spreads the grain over a space four inches wide, and these tubes may be separately attached to any drill.

Corn-Planters are made by using two, and sometimes three, tubes of any grain-drill, thus planting in drills many acres in a day. In clean land, well cultivated and not infested with weeds, drills yield on an average 20 per cent. more corn and a greater amount of fodder than hills. Most farmers, however, prefer planting in hills, to admit of horse-cultivation both ways; and at the West, where extensive fields are devoted to this crop, planting-machines are employed which will drop two rows at a time at right angles. The former practice for this purpose was to employ one person to drive the horses running at right angles to previous markings, and another person riding on the planter, discharging the seed for each two hills when exactly opposite the marking by a touch of the hand. But it was difficult to discharge the seed in exact cross-rows while the horses were walking three or four feet in a second, and the cross-rows were consequently made more or less crooked. An invention or modification has been devised to obviate entirely this difficulty, termed a "check-row planter." A steel wire is stretched across the field or a section of the field, having knobs or projections at equal distances apart, equal to the intended distances between the hills of corn. The planting-machine is driven alongside and parallel to this wire, and is so connected with it that every time a knob is struck the dropper is opened and the seed dropped and covered in passing. The wire is fastened to anchors at each end, and when the dropper has passed along its full length the wire is moved to a side-distance equal to the width of the next two rows. By this method entire accuracy is secured, the rows are made quite straight, and there is no necessity for previously marking the land, the stretched wire being a sufficient guide in driving, and the knobs doing their work with entire precision, without any care on the part of the driver. The planting may therefore be done daily as fast as the land is ploughed.

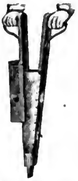


FIG. 25.—Corn-Planter.

Hand-Planters.—In corn-fields of moderate size the planting may be done in hills by the use of hand-planters, which the operator carries in his hand and simply strikes down at each hill, walking nearly at his usual gait. If the field is marked in one direction, he can walk and plant the field at right angles to the markings; or if the hills are to be within a foot or a foot and a half of each other, in rows only one way, he has but to follow the mark. Fig. 25 represents a simple implement for this purpose, known as the Northwestern planter. It is held in both hands, the movement of which deposits and covers the seed. The number of grains to the hill may be previously adjusted. It plants more evenly than can be done by hand, and the depth may be fixed. A man will plant with this implement six or seven acres in a day with hills three and a half feet apart, or three acres in a day with hills a foot and a half apart. There are other planters working in a similar way, some of them made to drop two hills at a time in opposite rows. There are also corn-planters drawn by a single horse and planting one drill at a time. A horse-planter for corn and cane, depositing the seed either in drills or hills, has been extensively used at the West. The Hoosier corn-drill plants and covers in uniform drills one grain in a place at any required distance. The Chautauqua planter consists of a single tube, and is held and worked by one hand, being used like a cane, and is self-acting as it is pressed in the ground. It is made wholly of metal, and may be adjusted to planting different kinds of seeds. Hoag's planter also consists of a single tube. These planters all operate well, are important labor-savers on moderate farms, and are sold at about $2.50 each.

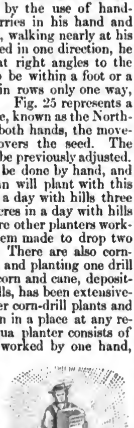


FIG. 26.—Seed-Sower.

Cahoon's Broadcast Sower.—This machine has been in use many years, and has been found to sow more evenly than can be done by hand, and to save labor by its rapid work. With the hand-sower the operator straps it to his shoulders, fills the hopper, and turns a crank, which causes a rapidly multiplied rotary motion of the seed-distributor, throwing the seed broadcast by its centrifugal force on both sides of the operator (fig. 26). The breadth of the cast will be according to the weight and momentum of the seed. Wheat will be thrown one rod on each side of the operator; barley, about three-fourths as far; oats, two-thirds; clover, eight or ten feet, or with a total cast of a rod or a rod and a quarter; and timothy, with a cast of about one rod. This machine is particularly useful in sowing grass-seed and all light seeds.

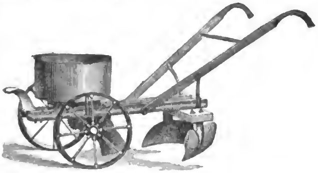


FIG. 27.—Potato-Planter.

True's Potato-Planter.—For this machine, which is represented by fig. 27, the potatoes must be assorted, so that those of nearly equal size may be put in the hopper at a time. It may be regulated to cut large or small potatoes. One at a time comes into contact with the sliding knife, which in cutting the pieces of nearly equal size would be likely to give them nearly an equal number of eyes. As fast as they are cut they drop one by one through a tube, which at its lowest end opens into a furrow. The machine places them at regular distances; the earth falls on them, and the coverers bury them at the proper depth. The hopper will hold about a bushel. The knife cuts them at random, but if the machine is regulated to cut the right size, each piece will be supplied with eyes. Where it is desired to apply concentrated fertilizers, a separate reservoir is provided immediately behind the seed-hopper. This machine is required only on large farms or where raising potatoes is made a specialty by the owner, and is best adapted to a deep mellow soil free from obstructions or stones; a man with a horse will cut and plant six or seven acres in a day.

Hand-Planters for Drills.—Hand-machines for dropping and covering small seeds at one operation have proved great and valuable labor-savers, not only for the limited garden, but for such field-crops as turnips, carrots, and onions. If the land is well prepared, they will do in an hour what an active man could not accomplish in a day, and with more uniformity of distribution. Among the machines for this purpose are the Matthews and Planet drills. The former opens the furrow, drops the seed accurately at the required depth, covers and lightly rolls it, and at the same time makes with mechanical precision a mark parallel with the present row for the next one. The agitator stirs the seed in the hopper, ensuring continuous delivery. It is readily changed for seeds of any size. In the Planet drill the cylindrical seed-vessel is placed at the centre of the double wheels on which it runs; the seed-reservoir continually turns over with the revolving wheels, thus preventing the seed from clogging. The openings for seeds of varying sizes are made larger or smaller by one rim sliding over the other; the holes, being rhomboidal in shape, are opened or closed as the rim is withdrawn or advanced. The plough for opening the furrow runs between the wheels, and the seed is covered evenly and accurately at the required depth.

(3.) *Cultivators.*

Single or one-horse cultivators are now used on farms of moderate size, and when the rows or drills are straight and parallel they not only save a great deal of labor in hand-hoeing, but by frequently pulverizing and stirring the soil, even if entirely free from weeds, add largely to the growth of the crop. Early in the season, before the roots of hoed crops have extended far, deep-running cultivators to loosen and mellow the soil are of much benefit; and afterwards a more shallow pulverization, frequently performed, is essential. In a good cultivator the points of the teeth, projecting nearly horizontally forward and being made of hard steel, enter the soil with great ease, the loosened earth being then gradually raised by the curve in the teeth.

For more shallow but efficient work an excellent implement is the thill cultivator. It is furnished with a pair of thills like those of a one-horse carriage, to which the frame holding the teeth is stiffly fastened, the rear ends of the thills forming the handles, which the driver holds and with which he guides the implement. A little pressure on these handles to the right or left enables him to guide it with accuracy and to run within an inch or two of the row at pleasure; and by slightly bearing down on the handles he readily increases the depth to which the teeth are made to run.

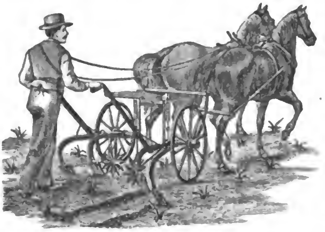


FIG. 28.—Mast's Walking Cultivator.

Walking and Riding Cultivators.—The cultivation of corn, potatoes, and other crops planted in drills and rows was formerly performed by a single horse, but of late years the use of two-horse cultivators, which will dress at least two rows at once (or more properly both sides of one row and one side each of the two adjacent rows), has become common, particularly at the West, and the driver accomplishes twice as much in the same time. Several Western manufacturers make them extensively. The riding cultivators have a seat for the driver, who guides accurately the cutting of the teeth with a lever. The walking cultivator, the driver following the implement on foot, is preferred by many farmers as being under more complete control. With the implement represented in fig. 28 the horses walk in the two contiguous rows, and two spaces or three contiguous rows are cultivated at the same time. It is provided with reversible shovels, is easily controlled, and may be rapidly changed from a riding to a walking cultivator, and *vice versâ*. Several additional conveniences are provided, among which are a simple mode for changing the width between the beams for wide or narrow rows, raising or lowering the beams, rotary shields (shown in the cut) to protect young plants from falling earth, and a foot-treadle for raising the shovels in turning.

Garrett's Horse-Hoe.—This is an implement which has been used for many years in England for cultivating drilled crops. It cleans seven or eight rows at once by means of sharp horizontal blades, which run slightly beneath the surface and destroy all the weeds within an inch of the rows of young plants. The rows are planted with a drill, and are made to correspond exactly with the width taken by the blades of the horse-hoe. The operator has only to keep his eye on one row and preserve the right distance, when all the rest of the rows will be properly cultivated. By changing the obliquity of the angle at which the knives run, they are made to cut a wider or narrower strip of ground. A lever guides the implement accurately. One man is required to lead the horse, and another to guide the implement, and on smooth and even land perfectly free from stone it will dress many acres in a day. It is a rather complex implement, and is hardly adapted to most of the soils in this country, where the smoothing harrow, properly used, would perform nearly the same work more rapidly and with less trouble.

(4.) *Machinery for Harvesting Crops.*

The severe labor required to cut grass and standing grain by hand caused many attempts at lessening this labor by machinery. During the early part of the present century machines were made by providing a large horizontal circle (with upright axis), the circumference of which was a continuous sharp steel edge. This was made to revolve rapidly a few inches above the surface of the ground, at the same time that it had an onward movement through the grass. But there were several formidable difficulties in the way of its success, and it was never adopted in practice. Various modifications were made, all with the sharp advancing circle. The foundation of the present great success was the *finger-bar*, now adopted in all mowing- and reaping-machines, the invention of Henry Ogle of Alnwick, England, in 1822, and his machine was put in successful operation, after much experimenting, by T. & J. Brown of that place. But the prejudice of the working-people against all labor-saving machinery, and the threats to kill the manufacturers if they continued to make the machines, caused the enterprise to be given up. The construction of this finger-bar has been greatly improved in this country, and is shown by fig. 29. Fig. 30 is the serrated blade, which passes through narrow slits in each of the fingers on the finger-bar, and when made to vibrate rapidly backward and forward by the cog-work of the machine the whole operates like a multitude of powerful shears and severs every plant in its course.

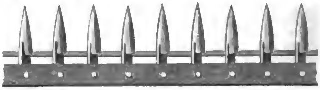


FIG. 29.—Finger-Bar.

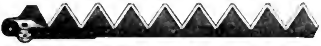


FIG. 30.—Knife.

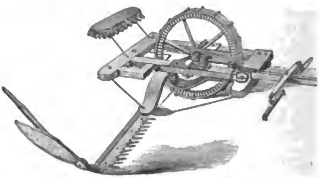


FIG. 31.—Ketchum's Mowing-Machine.

It is now over thirty years since mowers and reapers began to make their way into general use, and one of the best mowing-machines of that time was Ketchum's, of which fig. 31 is an accurate representation, where the cogs on the driving-wheel working the pinion at its side produce the rapid vibrating motion of the knives.

For years there were formidable imperfections in the mowing-machine. The blades and finger-bar often became clogged with the damp grass, to prevent which it was necessary to drive the horses uncomfortably fast; and when improvements were made so that the machines would not clog with a slow motion or in wet grass, it was justly regarded as a great triumph.

The First Successful Inventors and Manufacturers.—It may be interesting to record some incidents connected with the introduction into Europe of the best machines made in this country. Whatever credit may be due to Henry Ogle in 1822 for the original and imperfect finger-bar, or to Patrick Bell prior to 1840 for his cumbersome and unsuccessful reaper, the American machines were the first which were made with sufficient strength, lightness, power, and efficiency, combined with durability, to fit them for general use throughout the world. In the United States alone more than ten thousand skilled workmen are employed in their manufacture, turning out annually more than one hundred and fifty thousand machines, which sell for $15,000,000, and, with those made in previous years, saving in the season of haying and harvesting the labor of two million men.

The following account (condensed) of the trial of the American reapers in England in 1851 was written from London under date of July 29 by B. P. Johnson, for many years secretary of the New York State Agricultural Society. The place selected for the trial was Mr. Mechi's farm in Essex, 45 miles from London: "The day appointed proved, like one of the many days in England, incessantly rainy. One hundred and fifty or two hundred farmers and others had assembled to witness the trial. The wheat was not ripe, the crop very heavy, and everything as unfavorable as possible for trying the reapers. The people present were clamorous for the trial, and the person having Hussey's reaper in charge placed it on the field and a trial was made with it; but the green and wet grain clogged it. This damped, as you may well imagine, the spirits of many who had hoped for success, and the members of the jury proposed to discontinue the trial. But I informed them that McCormick's was there for trial, that it must be tried, and that I could not consent that gentlemen present who had come a long distance for the sole purpose of witnessing the trial should go away with the impression that our reapers could not do the work promised. McCormick's reaper was accordingly placed to its work with a single span of horses, and it went through the grain, green as it was, cutting all before it. When the machine stopped, the crowd around it was addressed by Mr. Mechi, who said: 'Gentlemen, here is a triumph for the American reaping-machine. It has, under all its disadvantages, done its work completely. Now let us, as Englishmen, show that we appreciate this contribution to our implements for cheapening our agriculture, and let us give the Americans three hearty English cheers.' They gave them, I assure you, with a will! The reaper was tried again, that it might be timed, and cut seventy-four yards in seventy seconds, doing its work to the satisfaction of all present. At this rate it would cut twenty acres in a day during their usual hours of work here. Hussey's was afterwards tried on a clover-field, and did its work well. A machine made here after Hussey's by Garrett was tried on the clover-field, but would not work. The English machinists must learn, if they expect to improve American machines, that they must work them." Before this trial the reaper had been on exhibition at the Crystal Palace, and had been ridiculed for its unusual appearance by the London *Times* as apparently a cross between a flying-machine and Astley's chariot. After the trial it was taken to the palace again, and the next day, Mr. Johnson stated, "it had more visitors, I believe, than the Koh-i-noor diamond itself." Mr. Johnson further remarked: "After the trial of the reapers about one hundred and fifty gentlemen sat down to a first-rate dinner prepared by Mr. Mechi, who presided, assisted by Lord Ebrington as vice-chairman. Several speeches were made. Lord Ebrington remarked that it must have been truly gratifying to their American brethren to witness the triumphant and complete success of the American reaper, and he coupled with his remarks the name of Prince Frederic of Holstein, who replied on behalf of the guests in a very neat speech, and concluded with the health of Mr. Mechi, who said: 'Our American brethren, descendants of this country, had sent us a reaping-machine, which had been in operation seven years in the United States, that would cut all the grain in England.'" A simple incident in connection with this trial is worthy of mention. Among the many interested spectators present was a harvest-laborer with his sickle in his hand. When he saw the complete success of the reaper, he at once, in sight of the crowd, broke his sickle in two across his knee, indicating that the usefulness of that implement had ended.

A trial of reapers took place in France in 1855, at La Trappe, on the farm of M. Dailly, postmaster-general of France. There were three American, two English, and two French machines. The former, McCormick's, Manny's, and Hussey's reapers, came out ahead, and one of the French next.

At the same trial four thrashing-machines were entered for competition and trial, six thrashers with flails working with vigor at the same time. The six flails thrashed in half an hour 54 quarts of wheat; Pinet's Belgian thrasher, 136 quarts; Dunoir's French thrasher, 227 quarts; Clayton's English thrasher, 373 quarts; and Pitt's American thrasher, 673 quarts.

Combined and Single Machines.—Combined machines—that is, such as could be used alternately both for cutting grain and for mowing grass—were the result of much thought and ingenuity, and for many years they were largely manufactured and widely used. But of late years it has been found that the machine which performs both kinds of work fails to do either satisfactorily. It is inconvenient to make the change required from one kind of work to the other; the reaper is needlessly heavy for mowing; and the cost of the two does not greatly exceed the expense of buying the combined machine. In the mower the simple, unobstructed cutter-blade passes through the grass; in the reaper a platform is required to collect the falling grain and straw: as soon as enough accumulates, the bundle is swept off with the hand-rake in the former hand-rake machine, or with the self-raker in those of more recent construction, and it is bound into neat bundles and cast off by the machine itself from the self-binder. The hand-rake requires one man to drive and another to cast off the gavels; the self-raker and self-binder need a driver only. Good self-binders, as now made, are of great value on large farms, the machinery, without attendance, doing the work of seven men in the matter of binding alone where the seven-foot cutter-bar is used.

Self-Binders.—The self-binders first introduced into use employed wire for binding the bundles, portions of which were successively reeled off from the large coil or spool as it was passed around the bundle, twisted together, and cut off with the automaton shears. But serious difficulties arose in consequence of the wire becoming mixed with the straw which cattle ate, and fragments of iron were found in the grain as it was ground in the mill. The first-mentioned difficulty was removed by using a pair of ingeniously made shears which cut and jerked the wire band from the bundle the moment it was placed before the thrashing-machine; the latter was obviated by lining with magnets the tube through which the wheat passed into the hopper for grinding. These magnets caught and held every fragment of iron, and thus *strained* the wheat of all the iron particles. The importance of these magnetic strainers was shown by the miscellaneous character of the iron fragments caught by them, consisting of scales from scoop-shovels, pieces of nails, and various other fragments; in one case twenty-five pieces of iron were thus picked out in grinding thirty bushels of wheat. Much of this difficulty is now prevented by using cord instead of wire for binding the sheaves, a practice which is generally adopted at the present time. Of the machines using cord, all accomplish the same end by unlike machinery; and to show the reader the ingenuity which has been brought to bear on this single part in the construction of reapers, we quote the substance of a description of the process: "The grain when cut is carried up on an elevator on the machine, and when discharged from this elevator it is taken by two arms (driven by cranks) called *packers*. These packers gather the straw into a bundle, which, when it reaches the desired size, presses against a trigger with sufficient force to release a catch and throw the tying apparatus into gear. The arms from both sides at once close in upon the bundle, compressing it tightly, so that at the moment of tying there is little if any tension on the string. All the grain is cut and saved; none is wasted, and the butts of the bundles are brought evenly together by an adjuster. By adjusting a screw the binder can be set to bind a bundle of any desired size. The tension can be altered so as to bind as tightly as can be wished. Every bundle delivered from the machine will be of the size set by the operator, and all will be bound equally tight."

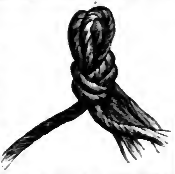


FIG. 32.—Knot of Self-binding Reaper.

Manufacturers of Mowers and Reapers.—A quarter of a century or more ago mowers and reapers began to be largely demanded, and many commenced their manufacture, mostly on a small or moderate scale. A want of long experience caused many defects in the machines, new difficulties arose, and most of these small manufacturers gave up the business. A list was carefully made out two or three years ago, by a competent person, of *one hundred and ninety* of these unsuccessful adventurers in different parts of the United States. Great skill and long experience were found to be essential in making perfectly working and durable mowers and reapers. There are consequently fewer manufacturers at the present time, a number of whom construct annually many thousands each, use the best machinery for performing the multifarious work, and employ many hundreds of workmen.

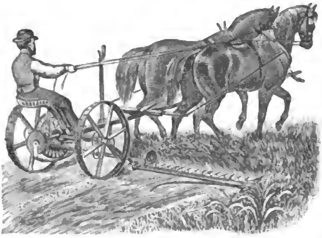


FIG. 33.—Adriance Buckeye Mower at work.

In the Buckeye mower and reaper, a representative of the most popular machines, the cutter-bar being forward of the driving-wheel, as with nearly all other good machines, and before the driver's seat, he has a full view of every part; his weight balances that on the horses' necks, and there is no danger of his being caught by the knives should he accidentally lose his hold. In the mower (fig. 33) the cutter-bar folds squarely over in front in driving from one field to another or on the road, as shown in fig. 34. The reaper (fig. 35) is furnished with a self-raker, and the ease with which it operates enables the driver to control its operation, and the size of the sheaf may be either regularly fixed or be determined every time by a slight pressure of the driver's foot. For driving on the road the platform is folded up compactly.

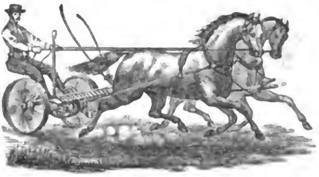


FIG. 34.

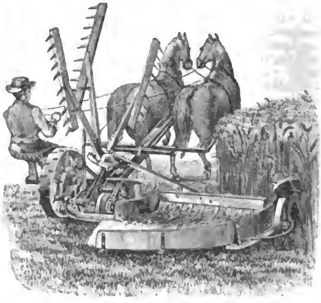


FIG. 35.—Adriance Reaper at work.

The making of self-raking, self-binding machines is a very extensive industry in the United States. One firm, at Auburn, N. Y., employs about 1400 hands in the busy season and makes 18,000 machines annually; another, at Hoosick Falls, N. Y., makes over 40,000 a year—counting mowers, reapers, and binders. Fig. 36 represents an Osborne self-binder at work in the field, giving the general appearance of the machine.

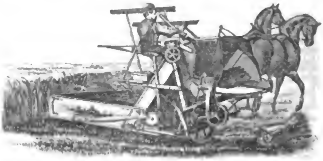


FIG. 36.—Osborne's Self-Binder at work.

Fig. 37 represents the Wood self-binding reaper at rest, showing the cutting edge and reel on the right and the self-binding apparatus on the left. The self-

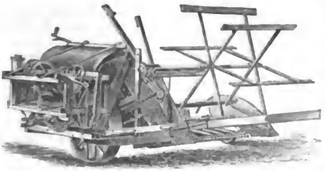


FIG. 37.—Walter A. Wood Self-Binder.

raking reaper, with its revolving rakes, is shown in fig. 38, and the mower in fig. 39.

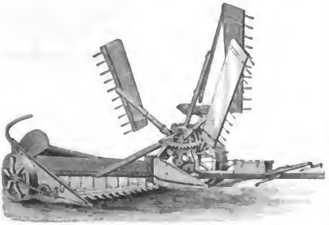


FIG. 38.—Walter A. Wood Self-Raker.

Wilbur's Eureka mower is quite unlike all the others in having the draught-pole in the centre of the machine, the cutting-bar between the two wheels directly following the team. One of the horses must of necessity walk on the uncut hay or grain. This, however, is found in practice to be of little detriment, while the cut grass or grain is entirely out of the reach of the horses' feet at the next passing. The peculiar form of the machine gives it some decided advantages in lightness of draught, steadiness of running, and breadth of swath.

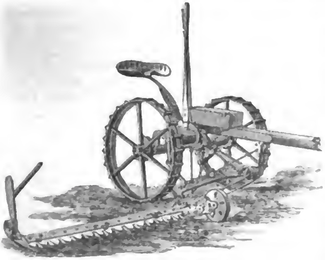


FIG. 39.—Walter A. Wood Mower.

Hay-Tedders.—The use of hay-tedders for stirring up, turning over, and facilitating the drying of newly-cut hay is of comparatively recent introduction into this country. They have been long known in England, and a few were brought to this country many years ago. But they were heavy and cumbersome, and were cast aside. The mowing-machine cuts and drops the hay in a parallel mass, to which the sun and air have not ready access, and the hay is slow in drying. The tedder tosses it up lightly, leaving its fibres crossed in every direction and in a condition to be quickly and evenly dried. The hay-tedder represented by fig. 40 scatters and turns the green hay with great rapidity, and a boy and horse with one of these machines will go over two or three acres in an hour.

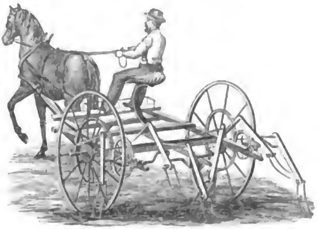


FIG. 40.—Bullard's Hay-Tedder.

The use of the tedder, when repeated three or four times a day, greatly hastens the drying process, and at the same time improves the quality of the hay by effecting a more equal drying. It enables the farmer to cut his crop in the morning, and to dry it rapidly enough to take it in the same day, and often to secure it in the face of approaching storms.

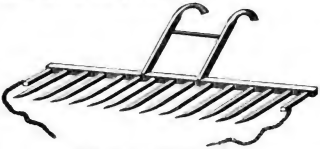


FIG. 41.—Original Horse-Rake.

Horse-Rakes.—The original horse-rake was of very simple construction. It was made of a piece of strong scantling three or four inches square, tapering slightly towards the ends, so as to give the greatest strength at the middle. It had about fifteen teeth, set horizontally, so as to run flat on the ground, with a slight turn upward at the ends to prevent their running into the ground (fig. 41). These teeth were about 22 inches long and 1 inch by 1¼ inches at their insertion, tapering toward the end. When this rake was used, the teeth moved forward on the surface of the ground and under the hay. It was held by handles, by which it was kept steady and for raising the head of the rake and tipping it forward for emptying its load. It was lifted by the handles, and the teeth set it anew for another load. The horse stopped for two or three seconds to discharge each load. To give it a steady motion, and to prevent the teeth from digging into the ground, the draught-ropes which served as traces to the horse were attached to a tooth at each end seven or eight inches long. The only skill required was to keep the teeth under the hay and above the ground. As with all horse-rakes, each load of hay was discharged opposite the one at the previous passing, so as to make continuous windrows. This simple original rake would perform about two-thirds as much work in a given time as the later revolving rake or the present steel-tooth rake, more labor being required for lifting it at each windrow, and it has passed entirely out of use. Yet on account of its simplicity and cheapness, costing not more than

$2 or $3, it would doubtless still be useful on very small farms.

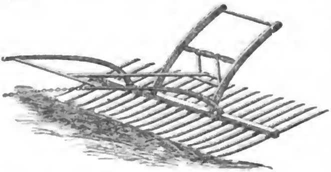


FIG. 42.—Revolving Horse-Rake.

The Revolving Rake (fig. 42) was next generally adopted, possessing the great advantage of being unloaded without lifting the rake or stopping the horse. It had a double series of teeth, pointing each way, and by a slight motion of the handle the operator caused it to make a semi-revolution at each windrow, discharging the load and bringing the opposite teeth into work.

An improvement, for the ease of the driver, was made by attaching a sulky, on which he was furnished with a seat, enabling him to do more work with less fatigue. The draught-poles were attached to the axle of the sulky, and the rake was tipped at each windrow by a touch of the lever, which extended near the driver's hand, in place of the handles.

Steel-tooth Rakes.—All the preceding rakes have been superseded by the lighter and more effective steel-tooth rakes now in universal use. There are many manufactured, but all are made with the same leading characteristic of curved steel teeth to hold the accumulating hay, the rake running between two wheels, with the driver's seat between. Each has its peculiar device by which the teeth are raised for dropping the hay. Some, of more complex construction, operate with more ease than others of simpler form and cheaper construction, but all answer a good purpose.

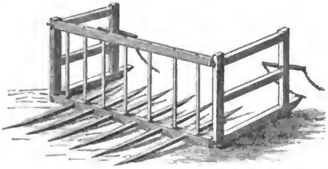


FIG. 43.—Hay-Sweep.

The *Hay-Sweep* was the invention of the late William R. Smith more than forty years ago, who resided then near Rochester, N. Y. An account of it was published at that time in the *Genesee Farmer*, and another twenty years ago, with illustrations, in the *Register of Rural Affairs*. Although an important labor-saver, it has not become generally or widely introduced, probably because not patented and no one was specially interested in its introduction; at the same time, it is easily made by any carpenter. It is essentially a large, stout, coarse rake, with teeth projecting both ways (fig. 43). An upright frame divides the space between the teeth, and to each end of this frame a small gate is hung on hinges, and to these gates the horses are attached. A boy rides each horse, the two walking at equal distances side by side. The two horses pass along on each side of the windrow, gathering up the hay between the two gates. With 500 or 600 pounds accumulated, they draw this hay to the stack, where it is unloaded by the very simple operation of the two horses turning right about, swinging the gates around with them, and at once pulling the sweep out from under the hay, and thus bringing the opposite teeth into play for the next load. The following are nearly the dimensions for the different parts of this implement: The main timber is 5 inches square, of very strong wood. A screw-bolt is placed through each end to prevent splitting, and at other places where apparently required. The teeth are about 20 inches apart, and may be round and inserted into 2-inch auger-holes, or square in 2-inch mortises. These teeth are about 6 feet long, projecting nearly 3 feet each way, and they should be properly sharpened at the end, so as to point slightly upward. The standards which form the frame between the two portions may be about 2½ feet high. The gates have the bottom timbers shaped and turned upward like runners, raising the head a few inches from the ground. Boys are better than men for riding the horses, as their weight is less and the horses work better with a light load. Fig. 44 shows the appearance of the sweep when at work.

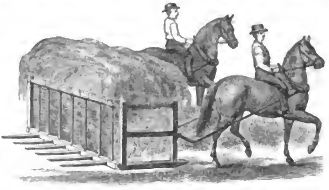
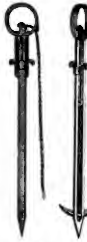


FIG. 44.—Hay-Sweep in operation.

Foust's Hay-Loader is attached to the rear of a hay-wagon, and drawn by the same team which draws the load. The wagon is driven astride the windrow, and the revolving motion of the wheels of the loader carries the hay upward on a steep inclined endless-chain platform furnished with spikes on its face, and drops it on the load, where one man is required to place it in position. With a boy to drive, two men on the wagon have loaded a ton in five minutes, but this was not ordinary work. If the crop is very heavy, the loader may be used without previously raking into windrows. It is useful for pitching barley or any unbound grain. It will not, however, work well except on smooth meadows; small stone-heaps are apt to be carried up with the hay.



FIGS. 45, 46.—Harpoon Hay-Fork.

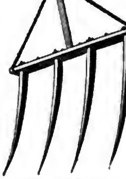


FIG. 47.—Original Horse-Fork.

Hay-Forks and Hay-Carriers.—The laborious mode of elevating hay to its place of deposit in the barn or on the stack has given place to the horse-fork and carrier, by which the work is done with horse-power. A two-horse wagon with a ton of hay is thus unloaded in five minutes, instead of the half-hour formerly required when the unloading was done by hand.

There are various forms of the horse-fork. The simplest is the harpoon fork, consisting mainly of a single iron bar (fig. 45), which in operating is plunged into the hay, when by a simple movement the spurs (shown in fig. 46) are opened and thrown out, and on withdrawing it by the force of the rope to which it is attached it brings away 100 or 200 pounds of the hay into which it has been thrust, the horse attached to the rope drawing it upward until deposited as desired. Another form is that of a large pitchfork, similar to the one shown in fig. 47, which represents one of the first used in this country. It was described in the *Albany Cultivator* in 1848 by P. P. Peckham of Bradford co., Pa., where it was first used. It consisted of a head made of strong wood, 28 inches long and 2½ inches square; the handle was 5½ feet long, mortised into the head, with band hoop over the head and extending up the handle. The prongs were of good steel, half an inch wide at the head, 20 inches long, and 8 inches apart. The rope extended over a tackle-block at the rafter, then down to the bottom of the doorpost, passing under another tackle-block, and to the outer side of the barn to the horse. The small rope at the end of the handle, held by the operator, kept the fork level as its load went up, when it was slackened, tilting the fork and discharging the load. The horse was then backed up for another load. It was an important advantage that the man on the load, being relieved from the severe labor of pitching, was fresh and vigorous for throwing on another load in the field.

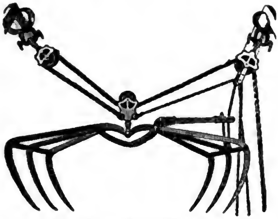


FIG. 48.—Raymond's Grappling Hay-Fork.

Since that day great improvements have been made in the horse-fork. The length of the handle made it difficult to use this fork under low roofs or through narrow doors or windows, but the various forms now given to it obviate the difficulty. The harpoon fork, already described, overcomes the difficulty, but it is fitted only for hay which has long fibre and will hang well together. For short or light hay, or for barley straw, the double or grappling fork is necessary. One form is shown in fig. 48, consisting of two three-pronged forks connected with each other by a hinge. It is secured in its position at two points, shown with the forks opened. It is raised or lowered with the double ropes passing over the two fixed pulleys and the pulley on the elevator, by which arrangement the horse moves twice as far as the load is raised, thus lifting twice as many pounds as he could over a single fixed pulley.

Hay-Carriers.—Hay-carriers are connected with horse-forks, so that the fork-load, when it reaches the desired height, begins to run horizontally by the continued traction of the horse, and is dropped at any desired spot. This horizontal motion, if on a single track, is obtained by a wheel or pulley running on the track under the rafters of the barn, made of an iron rod about five-eighths of an inch in diameter, properly supported. The hay-carrier saves the severe labor of pitching the hay to the back of the mow by hand, and gives also the important advantage of allowing wider bays for storing the hay. With this contrivance a man on the load of hay, with a boy to drive the horse, can unload a ton of hay in five minutes. The carrier may be placed outside the barn if desired, and it is also used to great advantage in building large stacks by means of the modification hereafter described.

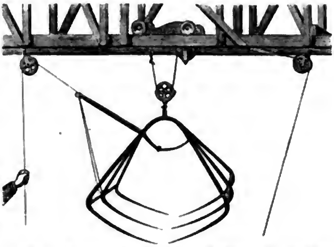


FIG. 49.—Grappling Hay-Fork and Railway Hay-Conveyor.

Fig. 49 represents the Weeks apparatus, made up of four distinct machines combined—namely, the Raymond grappling fork, the Powell elevating car, the attaching grapples, and the post-pulley. The fork is made of spring steel, opening from the top, and there is no danger of the workmen being injured by being caught on the prongs. When open the points are 4 feet 8 inches apart; they close and hold the load by their weight. The apparatus will elevate all kinds of hay or straw; a forkful is about 400 pounds. The car connected with the carrier runs on two rails of wood 5 inches apart, hung close to the peak of the barn, which gives it a steady and safe movement. Fig. 50 shows how the barn is filled from the outside, by which it is as easily performed as from the inside.

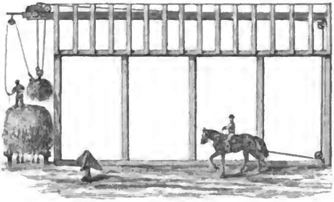


FIG. 50.—Putting Hay in Barn.

The *post-pulley* is a contrivance by which the horse has to travel but once over the ground for each forkful, and is saved from backing or returning empty. The post, with its pulley and casting-off plate, is placed half the distance from the starting-point from which the horse must travel to the extreme place of discharge.

The *attaching grapple* will grasp a timber from two to nine inches with one change of pin, and with it pulleys may be put up without climbing, and quickly changed when desired. It will sustain over a ton. Fig. 51 shows the method of using the fork in stacking by employing stacking-irons with ropes, pulleys, and grapples. Three long poles may be connected together at the top on each side of the stack, and they are kept from being drawn towards each other with the heavy loads by lashing the lower end of each outer pole to a strong stake (as shown in the cut) driven into the ground obliquely by first making a hole with a crowbar. It is well to place the two pole-tripods far enough from each other to give room for the stack or rick and to allow the wagon to pass within them. The elevator

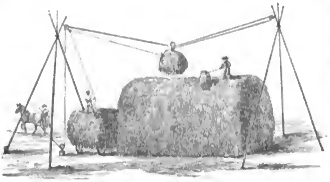


Fig. 51.—Stacking Hay.

first lifts its load from the wagon (or ground), and then carries it along the rope till the man on the load drops it by a jerk of the cord.

Fig. 52 represents the Church hay-carrier. This has four wheels with a broad tread running on a track suspended from the rafters of the barn, by means of which the fork with its load of hay is drawn upward to the highest point in the building, and then carried over to the place to be deposited, clearing the beams and ties.

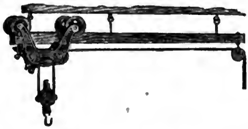


Fig. 52.—Church's Hay-Carrier.

Improvements in Hay-making.—Before the use of machinery, the cost of making hay cut with the scythe, raked with the hand-rake, and pitched and unloaded by hand, was reckoned equal to half the value of the hay; and it was not uncommon for farmers to let the making of hay to laborers on shares, each taking half. If hay was worth $10 a ton, it was reckoned worth $5 a ton to cut, dry, and draw it in, taking all the risk of showers of rain. It is not likely that men could now be found who would do the required work with the old tools at that rate, while with modern machinery it is easily performed for less than $1 a ton. This machinery consists of the mowing-machine, the hay-tedder, the horse-rake, the hay-sweep for short drawing, the hay-loader for lifting the hay from the ground to the wagon for longer conveyance, and the horse-fork and the hay-carrier.

The drawback to all the advantages in saving labor gained by these machines is their cost. A good mowing-machine may be had for $75 or $80; the hay-tedder for about the same; horse-rakes are sold at $30; the price for horse-forks and hay-carriers is comparatively small, while the fixtures for supporting them vary with circumstances; the hay-loader is about $75. The hay-sweep may be constructed by a good carpenter in two days. The whole cost of modern hay-making apparatus may therefore be placed at about $300. This apparatus would doubtless save $100 annually on a meadow of twenty acres yielding two tons to the acre, varying largely with circumstances, as compared with the old modes. On small farms the mowing-machine and horse-rake would be indispensable; the others would not be so necessary.

The following is an estimate of the cost of making hay, as practised by modern appliances: The farmer, using his own team and machine, would be able to run a mowing-machine for $4 a day, cutting eight acres of smooth meadow. The hay-tedder, requiring but little repair, and one horse with a boy to drive it, could be afforded for $2 a day, and half a day's work would thoroughly stir and turn the hay of the eight acres two or three times, the expense being $1. The hay-rake, with one horse and a man to work it, would gather the hay three times as fast as the mowing-machine would cut, and would rake the eight acres in three hours, at a cost of $1. The whole expense of cutting the eight acres or sixteen tons of hay, and placing it dried in the windrow, would therefore be $6, or 37 cents a ton. In rainy weather this expense might be increased; but if the tedder is used, facilitating rapid drying, there would be little danger with a fair amount of foresight. The cost of drawing to the stack or into the barn may be estimated as follows: If drawn to the stack with the hay-sweep, two boys would be required to ride and work it, one boy to ride or drive the horse which works the hay-fork, one man to use the fork, and two men on the stack to take care of the hay and place it in position. The whole force would be three horses, three boys, and three men, and they would stack the sixteen tons in half a day. The expense and wages would not be more than $8 a day, or $4 for drawing and stacking the sixteen tons. Adding this sum to the $6 for cutting and raking the hay, the entire cost would be 62½ cents a ton. This expense would be slightly increased in drawing to the barn, making the whole about 75 cents a ton. A smooth road and passage to the barn-floor would admit the use of the hay-sweep, which would answer well if the distance were not over a fourth of a mile. For longer distances and for loading the hay on a wagon a hay-loader would save much labor without materially increasing the preceding estimate. Allowing the hay to become soaked with rain would of course increase the expense and diminish the value of the hay. Farmers will vary these estimates according to the weight of their crops, the facilities they possess, and the skill with which they conduct the work.

Lawn-Mowers.—Since the wide introduction of hand lawn-mowers many country homes have become greatly improved in the beauty of the lawns which surround them. These efficient little machines will not only work with four or five times the rapidity of the former lawn-scythe, but also do the work more perfectly, without the required skill, and with greater ease to the operator. Although quite different in the form of the cutting part from the large mowing-machine, the cutting is performed on a principle very similar—namely, that of the shears. In the large mowing-machine the vibrating knives perform the shearing operation with the fingers through which they play; in the lawn-mower the revolving cutting edge becomes a pair of shears with the fixed blade against which it glides in its operation. The hand-mowers are made to cut from 10 to 18 inches wide; the larger ones, drawn by a horse, for parks and large open grounds, cut from 2½ to 3 feet wide. Most of the American lawn-mowers allow the grass to fall on the ground as it is cut, and, sinking between the short blades of grass, it serves as a mulching. Most of the English machines have a pocket or reservoir for retaining the grass and carrying it off from the ground.

Hay-Presses.—Where hay is bought and sold, packing it into solid bales is a process affording much convenience. The perpetual horizontal press, driven by horse- or steam-power, operates continuously, and forms successive bales as fast as the hay is thrown in. One man is required to pitch the hay, and another to bind and store the bales, or, when the press is run rapidly, a boy is necessary in addition to assist with the bales. Hay thus packed has three advantages in stowing away: it economizes room, it contributes to neatness and cleanliness, and it is safer against fire. With the perpetual press the bales may be made of any desired length and size, but those weighing about 100 pounds are usually found most convenient. The bales are in folded sections, and a single section may be taken off and fed at a time. The most rapid-working machines give from twelve to twenty strokes of the traverser in a minute. About fifteen tons of baled hay may be stored in a grain-car for conveyance. Hay-presses are sold at prices varying from $300 to $500 each.

(5.) *Thrashing and Separating Machinery.*

Before the invention of the thrashing-machine, grain was separated from the straw by the hand-flail and by the tread of horses. These modes have now nearly passed away, and the work is done with machinery. With the hand-flail 7 bushels of wheat, 18 bushels of oats, 15 bushels of barley, 8 bushels of rye, or 20 bushels of buckwheat, made a full day's work for one man to thrash and clean. A larger amount would of course be separated from the straw if the work were confined to thrashing only. A good two-horse thrashing-machine and separator, driven by a tread-power, would thrash and clean 160 bushels of wheat, 300 of oats, 200 of barley, 170 of rye, and 250 of buckwheat. Some place the estimate rather higher. A ten-horse steam-engine will thrash six times as much.

There are three modes in common use for applying power to drive thrashing-machines—tread-powers, lever-powers, and steam-engines. The tread-powers are usually adapted to two horses; three are sometimes employed. They possess some peculiar advantages over lever- or sweep-powers in the horses working in a straight line instead of constantly turning in a circle, and in the small space which they occupy. They are easily conveyed from one place to another, and may be placed on the barn-floor where the thrashing is performed. They are extensively manufactured, and as largely used throughout the country on farms of moderate extent, requiring little preparation to run them and few men to attend. They may be used for other purposes than thrashing, as sawing wood, cutting straw, grinding feed, etc. The power which these machines possess may be ascertained by the following process: The amount of friction is determined by first placing a horse on the platform when level, and then gradually raising one end until the weight of the horse will just give it motion. The difference between the inclination and a level will indicate with precision the amount of friction; if, for instance, the platform be elevated one-twentieth its length, the friction will be one-twentieth the weight of the horse and the platform. Next, to determine the power: When the end is still further raised, measure the difference between the increased elevation and the length of the platform. If, for example, the raised height is one-eighth of its length, and the horse weighs 800 pounds, then the power he exerts in walking on this rolling platform will be 100 pounds, or one-eighth of his weight.

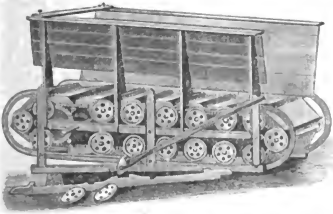


Fig. 53.—This represents the horse-power with guard-rail and two track-wheels removed, showing level tread and improved plan of gearing in both top and bottom of track.

Fig. 53 represents a two-horse tread-power, the upper portion being the pen in which the horses work, and the moving or rolling platform on which they tread is so constructed by a succession of steps that their feet always bear on a level surface, instead of on the common inclined surface. Fig. 54 is a section showing the gearing by which the power is imparted to the thrasher and motion to the wheels supporting the platform. The cost of the two-horse tread-powers is about $150. Lever- or sweep-powers are much less expensive, while they are less effective for an equal number of horses, and in working the horses require a driver. They are mostly employed where eight or ten horses are used on the larger machines. Steam-power is the most effective, as it works with uniform steadiness and never tires. Engines with ten or twelve horse-power will thrash 800 or 900 bushels of wheat or 1600 bushels of oats in a single day. In one instance a farm steam-engine thrashes 650 bushels of wheat in less than six hours. Eight or ten horses, working unsteadily and becoming fatigued, will accomplish little more than half as much as a nominally equal steam-power.

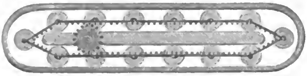


Fig. 54.

Thrashing-Machines.—The first thrashing-machines, introduced more than half a century ago, consisted simply of a spiked cylinder running in a spiked concave bed, driven with great velocity by a lever horse-power. There were no facilities for feeding the machine or for clearing away and separating the straw, chaff, and grain; and for an eight-horse machine at least twelve men were required while it was running, in raking the straw from the grain and in storing the straw and chaff. This work is now all done with machinery, the straw being taken away and deposited by the straw-carrier on the stack or mow without the labor of hand-pitching.

The thrashers now made in this country employ two modes for separating the straw from the grain. The Pitts machine, for example, employs what may be termed the "endless aprons," and with various improvements these have been extensively used. When not driven too rapidly, they answer an excellent purpose and make clean work. Another form is termed the "vibrator," which is furnished with a series of inclined fingers, the rapid shaking motion of which tosses up the straw and shakes out the grain, which falls through the slat-work on the screen below. The fingers merely rise and fall, and their motion sends the straw onward. The Farquar machine has a vibrator of ribbed sheet iron with projections and open spaces, the agitation shaking the grain from the straw. A measuring-hopper shows the quantity of grain which passes through the machine. Nichols, Shepard & Co. make their thrashing-machines with teeth so arranged that the feed of the machine can be increased at pleasure by causing it to take the unthrashed grain faster, or the feed can be diminished and clogging prevented when the condition of the straw requires it. The concave portions are in three movable parts, two containing teeth and the third blank. When the blank section is placed in front the feed is increased; when placed between the two which have teeth, the supply is diminished, and clean thrashing effected when the straw happens to be wet or in bad condition.

The Wheeler & Melick Co.'s thrashing-machine for rye carries the straw through unbroken for binding in bundles. The unthrashed straw is fed sidewise to a long cylinder passing between two corrugated surfaces which remove all the grain, and the straw is deposited even and parallel from an endless apron. It will thrash 3000 to 4000 sheaves in a day. B. Gill & Son manufacture a rye-thrasher which removes the grain and sends the straw straight and parallel over a carrier for binding. They also make a thrasher and cleaner which is supplied with a "duster," taking the dust from the front of the machine, away from the feeder and out with the straw.

Clover-Hullers.—George Geddes, in his admirable survey of the agriculture of Onondaga co., N. Y., remarked: "The agriculture of this county is based on the clover-plant, *Trifolium pratense.* It is used for pasture, for hay, and for manure. Strike this plant out of existence, and a revolution would follow, making it necessary for us to learn everything anew in regard to cultivating our lands." These remarks will apply to all portions of the country where red clover has become an essential part in the rotation of crops, in supplying food to animals, and in enriching the soil by turning it under with the plough. The extension of its culture has been largely or mainly owing to the invention of improved clover-hullers, which have made the seed an abundant market-product. Before the introduction of this invention the clover-heads were broken from the stems, preparatory to the process of hulling or the removal of the chaff, by the tramping of horses, by thrashing with flails, by cutting with cradles, by an instrument passed over the field and called a clover-comb, and by ordinary thrashing-machines. The hulling was afterwards performed by an imperfect machine employed for that purpose alone. The invention of Birdsell's clover-huller for rendering these operations cheap and easy has added millions to the agricultural wealth of the country. John C. Birdsell made his first combined clover-thrasher, huller, and separator in 1855. This first effort was not entirely successful. It cut the seeds to some extent, and had other defects, subsequently corrected. His patented machine was exhibited at the State fair at Buffalo in 1857. The patent was extended seven years, and expired in 1879. The peculiarities of its construction which give it its efficiency are a combination in one machine of thrashing and hulling, a bolting apparatus to separate the seed from the straw, a conveying apparatus to take the seed to the hulling-cylinder, and a winnowing apparatus to clean the seed from the chaff after the hulling. The hulling apparatus consists of a cylinder covered with iron, roughened like the surface of a rasp and case-hardened. This cylinder runs in a concave bed of iron with a rasp surface, and between them the seed is passed and the chaff is removed from the seed. It is then carried to a screen, when the seed is cleaned of the chaff. Before the introduction of this invention these different operations were often performed, after the clover-heads were broken off by the flail or with tramp of horses, by first tossing the straw with forks until the straw and heads were separated from each other, then sacking the heads and seed and carrying them to a huller, running them through, resacking and conveying back to the barn, where the whole was cleaned with a common fanning-mill. Enough seed was usually left in the chaff for sowing on the farm which raised it, and the cleaned seed was sold.

Soon after the introduction of the Birdsell machine the patent for Ohio was offered to an extensive reaper-manufacturer for a small sum, but the offer was dismissed with the remark that "all the clover-seed that would ever be grown in Ohio could be cleaned by two of these machines." There are now nearly 2000 in that State alone, and Ohio has become distinguished for its crops of clover. So important an invention had many imitations and infringements, resulting in expensive lawsuits, which have cost all the parties concerned on both sides over half a million dollars. About 9000 machines in all have been made since the invention.

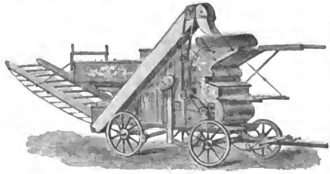


FIG. 55.—Victor Clover-Huller.

The Victor huller is shown in fig. 55. The cylinders and the concave beds in which they run are furnished with projecting rubbers or thick spikes with fluted surfaces, instead of the rasp surfaces of other machines. These rubbers, made of wrought iron, are nearly 2 inches long and nearly 1 inch wide in the first cylinder, and shorter and broader in the second or hulling cylinder. As their fluted surfaces play near each other, they wipe the chaff from the seed. Partial screens of leather are placed in the concave bed to prevent the seed from being swept through too rapidly and before the chaff is all removed.

Clover-hullers will clean the seed from twenty or thirty acres of clover in a day, making, where the crop is good, over 100 bushels of clean seed. A poor crop may not turn out a fifth part of this amount.

Feed-Cutters.—Experience has thoroughly proved the advantage of cutting the feed for domestic animals, and more especially cornstalk fodder, into fragments half an inch or less in length. The coarse stalks, otherwise rejected by cattle, being reduced to this fine condition, are all eaten if the fodder has been well dried or cured. Experiment shows that the fodder is thus usually doubled in value. Hay, straw, and other fibrous fodder may be mixed with meal after cutting and before feeding to animals. In storing green fodder as ensilage it is important to cut it into short fragments.

Feed-cutters are an old invention, and no important or recent improvements have been made in the principles of their construction. As at present manufactured, they consist of sharp blades made to revolve rapidly and cut closely along a fixed metallic edge, severing the fodder like a pair of shears. Formerly, the arrangement of radial knives working against the surface of a cylinder made of green hide was much in use, and it possessed some peculiar advantages; but it is now much less adopted than formerly, not cutting short enough, and it is not so well adapted to the rapid cutting of coarse corn-fodder by steam- or horse-power. Cutting fodder by hand is generally regarded as too slow, laborious, and expensive, except on small farms with spare labor in winter.

Green corn-fodder is cut more easily than dry, and since the introduction of silos for retaining it in large quantities till winter, cutters have been manufactured which will work up several tons an hour by steam.

Root-Cutters.—Formerly the root-cutters in common use cut the roots into hard thin slices, which were indeed in much better condition than feeding them whole. More recently, the kind of cutters termed *pulpers* is most approved. The pieces are softened by breaking up, the knives being curved and cutting slightly obliquely. The roots should be cut into small pieces for calves or sheep. Some of the best machines for this purpose cut three-fourths of an inch wide and half an inch thick. Roots pulped in this way may be mixed with cut fodder, and, if desired, with any portion of bran or meal.

Corn-Shellers and Fan-Mills are so well known to farmers generally, and their construction is so well understood, that a particular description is not necessary. Fan-mills have been greatly improved of late years, and many are now made which will not only clean grain of foul seeds of various sizes, but will separate the larger and smaller seeds of the same kind of grain; and in this way the farmer may select the largest and best for sowing, and thus maintain or improve the productiveness of his crops. The agencies employed for separating the different seeds are wind, gravity, and sieves of different sizes, which, working variously together, are capable of an almost unlimited modification. Fan-mills worked by hand are much less employed since the general adoption by farmers of the use of thrashing-machines and separators, the best of which turn out the grain in a good condition for market.

Potato-Diggers.—Many good potato-digging machines have been constructed by different inventors, but none of them have found their way into wide or general use on account of their cost or complex construction, being adapted only to large farms or extensive fields.

For limited work the common plough is used for throwing out the potatoes, followed by the hand use of the pronged hoe. An extensive cultivator of this crop informs us that after trying different machines he prefers the following mode: He always plants in hills forming rows both ways, and when the tubers are to be gathered he runs a one-horse cultivator between the rows in both directions, leaving the hills in square untouched blocks about a foot broad, finishing with a pronged hook by hand, with nearly the same ease with which they are gathered from the ground after a potato-digger. There are several machines which do good work, costing about $100—a price which places them beyond the reach of common farmers. The best of the cheaper machines are copied from the old digger used in England half a century ago, consisting of handles and beam like those of a common plough, with a single shank extending downward from the middle of the beam, carrying at its lower end a nearly flat blade like a sharp-pointed shovel, from the rear side of which a number of iron rods extend backward and slightly upward several inches. The implement is drawn by two horses walking between rows and running the flat blade under the row of potatoes between them. The earth and potatoes glide backward over the blade, and the iron rods sift the potatoes from the earth. They are then gathered by hand. An improvement is made by attaching short chains to the rear ends of the rods, which assist in shaking and sifting the earth from the roots and preventing bruising. The front end of the beam is mounted on two wheels, by which the depth is regulated. On land free from weeds and stones, the soil of which will crumble after the implement, diggers made in this form work well, but they cannot be relied on in all soils. Their cost need not be more than $15 or $20.

Cotton-Gins.—Before the invention of the cotton-gin the difficulty of freeing the cotton from the seed was so great that one hand could clean but a single pound in a day, and at the high price of 25 cents a pound it could not be made profitable. The quantity exported in 1792 was only 138,000 pounds, or less than 300 bales. But the cotton-gin, invented by Eli Whitney in 1793, enabled one person to clean several hundred pounds in a day, and by the year 1840 the production had amounted to 744,000,000 pounds; in 1860 it had reached over 2,000,000,000 pounds.

Though they have been materially improved, the cotton-gins made at the present time do not differ substantially from Whitney's early machines in the construction of the essential parts. The cotton is separated from the seed by a series of circular saws set on a rapidly-revolving cylinder. These saws pass through slits or narrow openings between the ribs which form the bottom or side of the hopper in which the unginned cotton is placed, the teeth seizing on and drawing the lint away and leaving the seed. The different parts may be understood by the accompanying simple figure (fig. 56), which is a sectional view of the Standard Machine Co.'s gin. The smaller circle is the saw-cylinder, and in contact with it is the larger brush-wheel for sweeping off the lint. Both revolve rapidly downward together in the same direction, but the brush runs slightly faster, carrying off the cotton. A section of the hopper is shown on the left above, and the portions of the saws which pass between the ribs may be distinctly seen. The "beater" B remains fixed, over which the lint is taken from the saw and straightened and made parallel. Additional brush-cylinders are used, one following the other as a "condenser" to bring the cotton into more compact shape. When good machines are in full work the snowy lint rolls out from the condenser like water over falls. The appearance of the cylinder of saws may be seen in the cut representing the Daniel Pratt gin (fig. 57), the cover of the hopper being raised to show this part of the machine and the saws passing between the ribs.

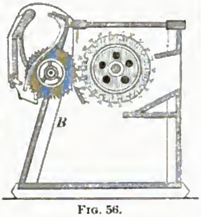


FIG. 56.

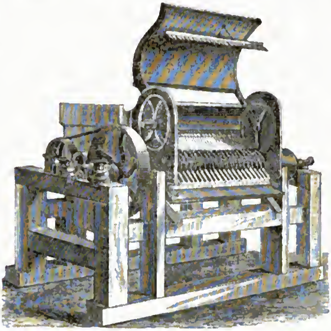


FIG. 57.

About 7000 cotton-gins are made annually by the various manufacturers in different parts of the United States to supply the demand for cleaning the vast cotton-crop of the South and its five or six million bales. The smaller gins, with thirty or forty saws, driven by horse- or mule-power, with about 300 revolutions per minute, will gin four or five bales (of about 450 pounds each) in a day. The larger gins, each with seventy or eighty saws, driven by steam, will gin nine or ten bales, and some rather more.

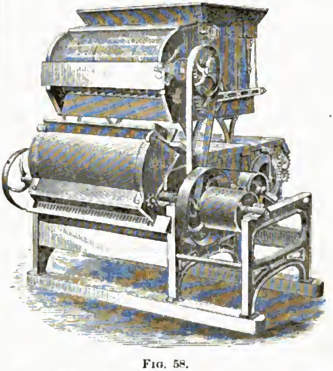


FIG. 58.

The Brown gin is shown in fig. 58. The frame is made largely of iron and the saws of cast steel, the brush-cylinder of bristles. The ribs, through which or between which the saws pass, are chilled as hard as cast steel. The saw-shaft contains from thirty to eighty saws, according to the size of the gin, and with feeder and condenser the whole is sold for from $75 to $284.

In Hall's self-feeding cotton-gin the self-feeding apparatus has for the bottom of the self-feeder a number of rollers, upon which rests the seed-cotton, which by the rollers is conveyed to the saw-cylinder. The feeding portion consists of a revolving cylinder furnished with steel teeth, and at the back of the cylinder is a hopper, the bottom of which consists of a number of rollers which revolve slowly to feed the machine. The gearing keeps the rate of feeding in accord with the velocity of the machine.

The Winship cotton-gin has an arrangement for blowing all the dust through an opening in the floor under the condenser, leaving no dust or fine lint in the room.

The Carver Gin Co., besides large machines, manufactures a "light-power cotton-gin," with saws 10 inches in diameter instead of 12 inches, as in the large ones, specially intended for easy running, to meet the wants of those raising a limited amount of cotton or those whose horse-power is not sufficient to drive the gins with 12-inch saws. This gin has received high commendation. (Fig. 59.)

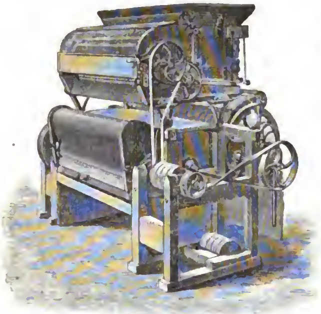


FIG. 59.

Improvements embodied in the Pratt gin are the "revolving heads" in the ends of the cotton-box, by which the friction of the cotton against the ends of the box is neutralized. This gin is represented by fig. 57, showing the interior of the feeder or hopper, the cover being turned up to show the saw-cylinder, a portion of which is visible, projecting through the inclined ribbed surface.

There are many other kinds of gins made in different States of the Union, which are variously preferred by different purchasers according to peculiarities of management. The prices of gins generally are about $3 for each saw for the gin alone, $1 for each saw for the separate feeder, and $1 for each saw for the separate condenser.

Corn-husking Machines.—The ingenuity of inventors was exercised for many years in attempting to devise labor-saving machines for husking corn, but for a long time all attempts proved failures, because they required the previous separation of the ears from the stalks, an operation involving nearly as much time and labor as the stripping of the husks from the ears. Philips's corn-husker obviates these objections, separating the ears and removing the husks entirely by machinery. The stalks, in small bunches, are placed on a platform, from which they are carried between two furrowed rollers, the butt ends first, which snap the ears from the stalks, the latter then passing on through the rollers and dropping into a pile. The ears, being retained on the opposite side of the rollers, drop on a sloping bed consisting of iron rollers revolving rapidly in opposite directions, and these, catching the husks on their teeth, rapidly strip them off, the denuded ears gliding down the inclined bed to the end of the machine, the husks falling through between the rollers into a third bed. The stalks are thus placed by the machine in one heap, the husks in a second, and the ears in a basket. The frame of this machine is 4 feet long and 2½ feet wide. The rollers which strip off the husks are furnished with spikes set in a spiral direction around them and working into corresponding holes in the opposite rollers, so that they work together in close contact. The ears, whether large or small, are completely divested of their husks and silk. The stalks are crushed, but not torn.

Jones's corn-husker is similar in its main parts, with some difference in the details, among which are the corrugated husking-rollers, instead of those with teeth and holes, as in the Philips husker.

Drain-Tile Machines.—One of the greatest improvements made in American farming within the last half century has been effected by tile-draining. Fertile lands which formerly were too wet to work for several weeks in spring have now by a regular system of tile-draining been fitted to plough as soon as the frost disappears from the ground. These drains are usually cut two rods apart, and their whole cost when completed has been about $30 or $35 an acre. In many instances the value of the land has been at once doubled, or even tripled. The increased crops have generally paid the entire cost in three years. A well-drained field may be ploughed much earlier in spring than one soaked with water, and vegetation makes an earlier start, the season thus being virtually lengthened. Farms in the Northern States by thorough draining have enjoyed all the advantages of those situated two or three degrees farther south.

It has therefore been a matter of great importance to the farming interest in all regions where underdraining is required that machines be introduced which shall manufacture tile rapidly and cheaply, and at the same time do the work in the very best manner. It is estimated that at the present time there are at least 1500 tile-making machines in different parts of the Union, and the vast number of tile which they manufacture for use may be inferred from the fact that each turns out some thousands in a day. One of the best machines for this purpose is well represented in the accompanying cut (fig. 60). It is made wholly of iron and steel, and possesses power and durability. It may be driven with either horse- or

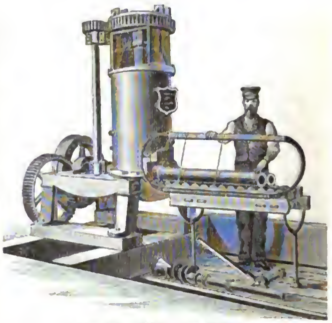


FIG. 60.—Tiffany Tile-Machine.

steam-power, the belt-wheel at the rear end being for steam, and the cap and socket at the top for the insertion of the lever for the horses. It will take the clay from the bank or natural bed and grind it into perfect condition for the tile, discharging the stones. Chilled-iron augers drive the clay through the moulds, and with steam-power the clay pipes are made as fast as the workmen can remove them. One of these machines, with a ten or fifteen horse-power engine, will turn out 15,000 two-inch pipe tile in a day, 10,000 three-inch, 5000 five-inch, and 2000 eight-inch. The cut nearly explains itself; the tile, issuing from the tub or reservoir, is cut off and removed by the workmen.

If each of the 1500 tile-machines in use turn out 5000 tile a day for 206 days in each year—and 1000 tile are sufficient to drain an acre—then the underdraining performed each year in the United States amounts to 1,500,000 acres annually; the value of which, if only equal to the cost, would be over $50,000,000.

VI. *Steam, Water, and Wind Powers.*

These have obtained a wide introduction within a comparatively few years, and are now used almost exclusively for thrashing grain and for other purposes on large farms, and are generally employed by itinerant thrashers. The extent and value of these engines may be understood when it is stated that there are now hundreds of manufacturers, who turn out about 6000 annually.

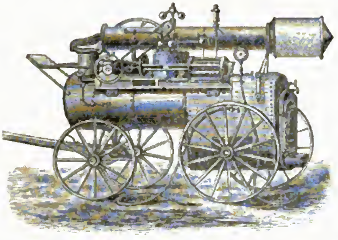


FIG. 61.—Wood, Tabor & Morse's Engine.

Fig. 61 represents one of the portable farm-engines of Wood, Tabor & Morse, showing the manner in which the smoke-pipe is turned down for conveyance from one place to another. They are made of different sizes, of six to fifteen horse-power, the larger one being sufficient to drive any thrasher and separator as rapidly as any gang of men can handle the grain and straw. The engines manufactured by this company are employed, besides for thrashing, for running planing-mills, shingle-machines, and saw-mills, and for grinding feed, cutting fodder, and other purposes.

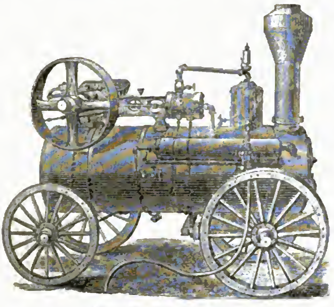


FIG. 62.—Payne's Portable Engine.

An example of the larger portable engines is shown in fig. 62. Those with vertical boilers, as represented in fig. 63, are valuable for their compact form, small consumption of fuel, and efficiency. The smallest size is of two horse-power, and consumes less than a bushel of coal a day. An experiment was made by two competent engineers with one of the four-horse vertical engines, which made 227 revolutions per minute and consumed 25 pounds of coal in an hour, each pound of coal evaporating 8 pounds of water. The compactness of this engine is shown by the 4-inch diameter of the cylinder, the 14-inch diameter of the grate, and the 18 inches in height of the fire-box, and the boiler holding two cubic feet of water.

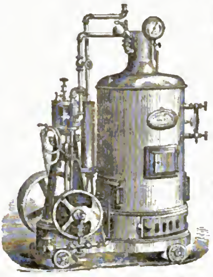


FIG. 63.—Payne's Vertical Engine.

As indicating the prices at which farm-engines are sold, it may be stated that Payne's four-horse engines, with vertical wrought-iron boilers, are sold for $350; six-horse, $450; ten-horse, $550; three-horse, $250. Wood, Tabor & Morse's horizontal engines, ten-horse, sell for $775; fifteen-horse, $1000.

The rapid improvement in the agricultural machinery of the country is indicated by the great number of manufacturers of well-made and efficient farm-engines, those machines which have been mentioned being only representatives among the many.

Traction-Engines.—Many of the manufacturers of farm-engines make what are termed "traction-engines," which will run on a common road by the power of the steam they generate, facilitating their conveyance from one place to another. When travelling on a public road it is necessary to attach a team in front, to lessen the danger of frightening horses. These traction-engines will travel at the rate of from three to six miles an hour, and will ascend ordinary grades in the road. Some have moved eight miles an hour.

Water-power on Farms.—Where streams of water of moderate size and with some fall cross a farm, the owner may advantageously employ them to furnish motive-power for such work as grinding feed, driving thrashing-machines, sawing wood, shelling corn, cutting fodder, churning, and for other purposes. A sufficient fall may sometimes be obtained by bringing the streams along the hillsides or over bluffs. The water of small streams may be accumulated in dams or ponds, giving a power of a few horses one day in each week. Such power would be cheaper than that of horses or of steam.

An example of the very successful application of water-power to driving farm-machinery exists on the Geddes farm, near Syracuse, N. Y. The stream which crosses the farm has 16 feet fall, and is chiefly employed during winter, at which time it affords about 60 gallons a second, besides some escape-water at the waste-weir. It turns an overshot water-wheel 12 feet in diameter, having ten or eleven horse-power. In a building which contains the water-wheel it grinds feed, shells corn, and turns a grindstone and lathe, and by means of an endless rope running from the water-wheel to the barn, 200 feet off and 60 feet higher, it slices roots and cuts corn-fodder, and is intended to churn butter in a building adjacent. It has not yet been applied to thrashing grain, but the power is amply sufficient to drive a large thrasher. The buhr-stones of the mill are 18 inches in diameter, having a horizontal axis, and are cased in iron. They make from 700 to 900 revolutions in a minute, cost $100, and grind finely 20 bushels an hour of a mixture of two parts of oats and one of corn—of oats alone, 25 bushels, and of clear corn, 12 or 14 bushels. The meal is either bagged in the basement below by suspending the bag to the lower end of the tube through which the meal is discharged from the stones, or more commonly is taken by an ordinary elevator to the side of the car in the upper story, where it is bagged, loaded on the car, and rolled out on the tramway to the wagon which brought it.

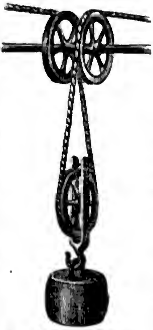


FIG. 64.—Rope Tension.

The endless rope which drives the machinery in the barn, 200 feet distant, is manilla, seven-eighths of an inch in diameter, and as it is used and exposed chiefly in winter, it is expected to last six years, according to experiment. To prevent a variation in the tension of the rope with wet or dry weather, a tightener is placed at the middle, which consists essentially of a hanging loop in the rope, running over and supported by wheels, and from the lower part of the loop a weight is hung, always keeping the rope in the same degree of tension. Fig. 64 represents this contrivance, with the frame and posts which support it omitted. One of the ropes (the one represented) passes over a fixed wheel, then down and around a wheel in a frame which moves up and down, then up and around another wheel alongside the first, and then onward. The weight on the movable frame weighs 250 pounds, and when the rope is wet and shortened the weight rises, and when lengthened by dry weather it descends. In this way the tension is always the same. The other rope (or portion of the endless rope) has no loop in it, and is kept in place by passing in the outer grooves of two other wheels edge to edge. As the barn stands diagonally to the water-wheel, the ropes are brought square with it by passing around two wheels and up and around a third.

Thick ice is prevented from forming in the mill-pond or obstructing the current by drawing off the water for use each day, and allowing it to fill the pond in the night. The water-wheel is surrounded with a thick wall in a wing which is largely banked with earth, and which never freezes. This wheel is 12 feet in diameter, and has buckets 4 feet long. The buckets have each three auger-holes of one inch near the bottom, admitting air and allowing the free and ready reception of water or its discharge at the bottom of the revolution. The overshot wheel is better adapted than a turbine wheel to the variable supplies of water at different seasons of the year, as it may be run when the amount is diminished to a twentieth of its full force. After using this machinery several weeks, George Geddes wrote (Feb., 1882): "We are now cutting barley straw and mixing it with ⅓-inch cornstalks; the cows eat the mixture well. This machinery must lead to our raising more corn, feeding more cattle, making more manure, and raising our grain on less acres." The entire cost of all the works was about $1500. (For more minute details see *Country Gentleman* for 1882, p. 103.)

Wind-Mills.—A powerful agent for driving machinery exists in every part of the country in the form of wind. Unlike water-power, it does not require dams and mill-races; it does not need the fuel and fire of the steam-engine; it involves none of the care and labor of horses. Water-power exists only in certain localities; the wind blows everywhere. It may be employed in places where other kinds of power are difficult to obtain, as, for example, on the broad plains of the West, or where the wind has a long and steady sweep over level land. But a serious drawback is its extreme irregularity, and inventors have exercised their ingenuity to meet this difficulty by self-regulating contrivances which shall equalize the motion, whether in strong or light winds, and which shall provide for safety in furious gales. Small wind-mills with fixed sails, if not more than four feet in diameter, may be employed with safety if strongly made, and they may be used for pumping water on farms. They will require care in violent storms. If larger, they must be provided with a self-governor. A simple arrangement for this purpose is to counterpoise by a weight the force employed to bring the sails against the wind. When the wind is moderate, the weight bears down and forces the wind-mill into a position to receive its full force. When the wind is violent, the weight is lifted by it, and the wind-mill swings around with its edge against the current, and its motion is diminished or entirely arrested. The Eclipse wind-mill, and all others which have "solid wheels," are furnished with similar self-regulating contrivances. In the Halliday wind-mill the arrangement is quite different, the circle of fans remaining at all times facing the wind, but the degree of their angle to the wind is regulated by centrifugal force, by which the greater the velocity the more completely the edges of the fans are set toward the wind. The Challenge mill is self-governing, operated by a weighted lever depending for its action upon the element which gives the wheel its power.

The efficiency of wind-mills cannot be reckoned, as with other forces, by horse-power, as they may do many times more work in a stiff gale than in a gentle breeze. They are rated by their diameter, and the work they will perform may be found approximately by applying to them the common tables of the force of wind at different degrees of velocity; or its force may be ascertained for any velocity, when any given force is already known, by keeping in mind the fact that its force increases as the square of the velocity. For example, the pressure on a square foot when the wind moves ten miles an hour being known to be half a pound, at twenty miles it will be two pounds, at forty miles eight pounds, and so on; or if there is a gentle breeze of only five miles an hour, the pressure will be one-fourth of half a pound, and at two miles an hour it will be but one-fiftieth of a pound. The figures are very easily applied to working wind-mills. Find the area of all the sails, deduct their average velocity from the speed of the wind, and their power may be ascertained.

In all wind-mills the sails should have the right degree of inclination to the wind. If they were to remain motionless, the angle would be different from that for motion. They should more nearly face the wind in practice; and as the extreme ends move faster, the outer portion of the sails should be flatter than the more central parts. They should therefore have a twist, and while the tips should stand about 83° to the direction of the wind, the middle may be about 72°, and the centre or near the axis, 68°. It is also important to load the mill enough to retard its velocity, so that the ends of the sails may move about as fast as the wind.

Since the force of wind may be applied on farms to so many useful purposes, such as pumping water for cattle, cutting feed, sawing wood, shelling corn, turning a grindstone, and churning, inventors have exercised their ingenuity and skill, and many good inventions have been the result, which have become largely introduced on farms.

The extent to which wind may be brought into use varies greatly with localities. Wind-mills cannot be advantageously employed in sheltered valleys or under mountains and high hills. On broad, level plains or on the margins of wide lakes, where the wind is continuous and steady, they perform good service. It has been found by careful and continued observation that along the Atlantic and Pacific coasts mills in favorable localities will run about eight hours in twenty-four, taking the average of the season through. In the Middle and Northern States, away from hills and mountains, the average is six hours in twenty-four. On the broad plains of the West and North-west the time is seven or eight hours, while in the Southern States it will not exceed five hours.

In all places where surface streams fail in the dry season of the year wind-mills may be employed to advantage by the farmer in pumping water for his domestic animals where wells contain the supply. In their absence impure and muddy pools are too often resorted to, and cows cannot furnish pure milk when compelled to drink such deleterious matter; or the animals are driven long distances for water, to their fatigue and injury. A small or medium wind-mill will draw enough pure cold water from a well to furnish a continuous supply. If the reservoir which contains it is large enough, it will hold a sufficient quantity to extend through a few days of calm, should such a period occur.

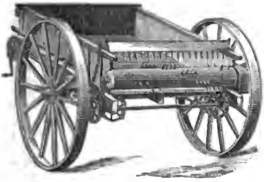


Fig. 65.—Kemp's Manure-Spreader.

Kemp's Manure-Spreader.—This machine consists of a cart holding thirty or forty bushels, with large wheels and broad tire, so as not to cut into soft soil, and having a short tongue to connect it with the forward wheels of any farm-wagon at the king-bolt (fig. 65). It has a movable bottom like the travelling bed of a tread-power, which when in use moves slowly and carries the manure toward the rear of the cart, where it meets a swiftly-revolving cylinder armed with teeth, which tears the manure into fine fragments and scatters it on the ground as the spreader is drawn along. The manure as it is shot out of the rear of the spreader resembles the chaff blown from a fanning-mill or the straw streaming from a thrashing-machine. It will thus pulverize all coarse or fine manure or ashes, lime or other special fertilizers if in lumps, and any concentrated fertilizer may be easily and thoroughly mixed and finely spread by placing it on the top of a load of manure. The load is discharged from the cart in about one-tenth of the time required to do it by hand. The quantity applied to an acre may be accurately regulated by the machine—from five to forty loads. A separate drill attachment will deposit special fertilizers in drills. In using this manure-spreader two of the machines will enable their owner to convey the manure and spread it perfectly over the land with great rapidity, one of them going to the field (when the distance is not great) and spreading the load while the other is receiving its load at the barnyard. Two men will thus be constantly occupied in filling the cart, and the number of loads drawn each day will be limited only by the amount of manure they can throw into the carts. On small farms a single machine may answer; the only work the driver has to perform is to fill his cart for each load. On large farms, where the distance to the fields is considerable and the amount of manure is great, three may prove most economical. When drawn long distances the manure may be brought in common wagons and thrown into the spreader by hand, which will distribute it more rapidly and perfectly, and in much less time, than could be done in any other way. Some intelligent farmers regard this machine as a labor-saver scarcely less important and valuable than the mower and reaper, and there is no doubt that the fine pulverization and even distribution of the manure make its value twice as great as when spread and ploughed under in lumps. (J. J. T.)

CHAPTER IV.

Manures in American Agriculture.

Manure is that which can increase needed plant-food in the soil. The derivation of the word is the same as that of *manœuvre*—literally, "hand-work"—and it seems originally to have meant "tillage." That sense is now, however, entirely obsolete. The word "manure" now means something added to the soil to increase its productiveness. A fuller definition would perhaps be, any substance that can directly or indirectly supply the elements needed by plants, and most likely to be lacking in the soil. Animal voidings, bone, flesh, blood, fish, scrap, superphosphates, and kindred substances supply the elements *directly*. Lime, salt, land-plaster, and some other substances used as manures supply plant-food *indirectly;* they do not themselves largely contain plant-food, but help to render available that already in the soil. To be used, or even classed, as manure a substance must not only contain needed plant-food, but must be sufficiently small in bulk, weight, and cost to make its use as manure profitable. Turf and low-grade muck contain plant-food, but the cost of cartage and applying commonly forbids their use as manures. Oil-meal, bran, and meal, on the other hand, though rich in plant-food, are worth more to use first for something else.

The three essentials to plant-growth most likely to be lacking in cultivated soils are *nitrogen*, *phosphoric acid*, and *potash*. Many centuries of groping agriculture slowly discovered that animal voidings somehow increase plant-growth, and that it pays to save them and apply them to the tilled soil. It was, however, left to the chemical science of the last half century or less to show why it pays—what it is in these voidings and in certain other substances that so increases plant-growth; and that the valuable elements are almost infinitesimally small in bulk and weight—that a ton of mixed animal voidings, for example, owes nearly its whole value to about 32 pounds of nitrogen, 30 pounds of potash, and 10 pounds of phosphoric acid contained in its 2000 pounds; also, that other substances than animal voidings contain these three precious elements in more condensed form. This last discovery laid the foundation for the manufacture of commercial fertilizers, and introduced a new era in agriculture.

Since manure contains the lacking elements of plant-growth, it naturally follows that where soils show no lack of fertility little attention is given to manures or fertilizers. This is usually the case in newly-settled lands, in "virgin soil;" and soil-exhaustion is seldom anticipated till it begins to come.

American agriculture is in this condition. It is in its infancy, and has all the disadvantages and crudities of childhood to contend with. We have not been willing to profit by the experience of others. Having a fertile virgin soil, we have deemed its richness inexhaustible, and have in each new locality paid little attention to the proper saving and use of even our natural manures. We have drained the best life out of our new soils, and then hastened on to repeat the process of impoverishment in the newer regions of the West. We have pursued a method of agriculture fearfully exhaustive of fertility. The present farming in Kansas and Dakota is not *farming* at all; it is simply *mining* for corn and wheat—drawing on the hoarded fertility of centuries and millenniums. Not until our soil shows signs of exhaustion do we think of feeding. We reverse in our agriculture the great law of Scripture, of nature, and of true philosophy: "To him that hath shall be given," etc. We take away fertility from the soil that has it, and to that which has it not we at last are forced to give. In our Western prairie States we are at a fearful rate taking from the soil the wheat- and corn-producing elements that are to us a heritage of the centuries past, and that should be from us a legacy to the generations to come after us. The farmers of the Old World can have little conception of the indifference, nay, almost contempt, in which manure is held in our rich prairie-regions. That is almost literally true which is commonly supposed to be a burlesque or a bit of fine irony, that "when the dung-pile grows larger than the barn, *the barn is moved.*" The present writer asked Mr. Dalrymple, the Dakota wheat-king, what he expected to do with certain immense piles of horse-manure near the several stables where the teams are kept that plough and seed and harvest his 25,000 acres of wheat annually. "Do with it?" said he. "The Lord only knows. There's the manure of eight years since we began here, and we've no earthly use for it." The rich black soil is from one to three, and even four, feet deep all over our great prairie regions, and is especially rich in nitrogen slowly gleaned from the air by the successive growth and decay of vegetation for untold ages. It has even seemed to be too rich in nitrogen for the cereals except maize, causing them to lodge and not mature the grain. For this or some other reason the "roughage" of crops has been neglected, the entire straw and stalks being burned in huge piles wherever convenience might direct; the whole of the nitrogen and accumulated carbon being thus wasted, and even the ash-elements being thus accumulated in useless piles. It has usually taken about a score of years to convince the farmers of each new region of the folly of this exhaustive style of farming. Slowly, and forced by facts and failures, they begin to keep more stock, and to save and use the straw and cornstalks, and the solid, and finally the liquid, voidings of their farm animals, and at last to buy mill-feed to balance their grain-sales, and even to buy commercial fertilizers.

This saving of domestic and purchase of commercial fertilizers may be said to be a matter of gradual westward progress. It has now reached the longitude of Ohio, and is beginning in Indiana, and even in Illinois and farther west. Contrary to what might be expected, too, the purchase of commercial has increased the saving of domestic manures. The use of the former has shown both the cost and the value of manures. And the results are apparent in the crops, as shown by official statistics. In Ohio, for example, the wheat-yield has greatly increased, even above that of her virgin soil. The average yield per acre from 1850 to 1877 was only 11·61 bushels, and the average annual total was only 19,487,000 bushels. But for the six years since then, during the new era of better tillage, more careful saving of domestic and purchase of commercial fertilizers, the average has been 16·23 bushels per acre, and the average annual total has been 39,226,000 bushels. Thus, the yield per acre has been increased 40 per cent., and the annual total has been more than doubled. The annual crop is worth about $25,000,000 more than before, while by the official figures less than $1,000,000 has been paid for fertilizers. These fertilizers have been used almost exclusively on wheat and corn, while rye, oats, buckwheat, barley, and potatoes show no corresponding increase in yield.

Domestic Manures: Mode of Saving.—In the Eastern States of the Union nearly as great care is now taken as in England to save the voidings of domestic animals. Bedding, or "roughage," is scarce, especially in the milk- and the fancy butter-producing regions near our great cities. Hence, a large part of the barns are built with tight manure-cellars and with lattice floors or trap-doors above in the rear of the cows, so that the manure is passed directly into the manure-cellar. Here the solid and liquid excrements are mixed, sometimes by hogs, with whatever bedding or absorbents are used with the cattle and horses. The manure is perfectly protected from the weather; the proportion of urine prevents excessive fermentation, with consequent loss of ammonia; and, provided these cellars are really water-tight and well managed, the manure need suffer only the minimum of loss. And it is a noticeable fact that wherever these bank-barns with manure-cellars are found, there also are found thrifty farms and very heavy crops, especially of grass, corn, and green-fodder crops.

Much attention is now paid to kinds of feed, with reference not only to their food-value for stock, but to their food-value for plants: that is, their manure-value. And it is a fortunate as well as remarkable fact that, as a rule, what are best for the former (such as oil-meal, wheat-bran, and the like) are also best for the latter; that is, they are also rich in nitrogen and phosphoric acid. And so some milk-farms near our large Eastern cities, that once were scarcely more than drifting sand or infertile clay, have become most productive. In some cases the dry, infertile surface of the fields has been carted into the stables, placed in water-tight gutters in the rear of the cows until saturated with urine and mixed with dung, and then carted out and spread upon the fields again to enrich the soil. And so this thin, dry layer from some barren fields has literally passed through the stable on its way to fertility.

Manure on Dairy-Farms.—In the great dairy-regions, however, of New York and Ohio there has been until quite recently an almost criminal waste of the best parts of the manure. Theoretically, a dairy-farm should deteriorate less rapidly (or, rather, should grow fertile more rapidly) than a grain-farm. A hundred dollars' worth of cheese sold from the farm (and something must be sold) removes scarcely one-fifth as much nitrogen, and not one-tenth as much phosphoric acid, as a hundred dollars' worth of hay, wheat, etc.; and a hundred dollars' worth of butter removes almost nothing of value to the soil. The product sold is a more condensed form. Our grasses, grains, and roots may, in a rough way, be said to contain two classes or kinds of elements—the one class chiefly carbonaceous, and fit for animal food; the other partly nitrogenous and partly mineral, and fit chiefly for plant-food. When our domestic animals eat hay and grain, they simply take the food fitted to support animal life and make animal products, and reject in their voidings the plant-food almost undiminished. What the animals use is chiefly carbonaceous matter; and there is never a lack of carbonic acid in the great chambers of the sky, and it is eagerly absorbed by the leaves of growing plants. And so the plant-food in the hay and grain is or may be nearly all saved for the plants in the animal voidings. Dr. Emil Wolff, in his work on manures, estimates, as the mean of many analyses, that in the mixed dung and urine of the horse, ox, sheep, and pig there is found 83 per cent. of the total nitrogen contained in the food, and 103 per cent. of the total mineral matter; the 3 per cent. surplus coming from minerals (lime, etc.) contained in the water. The phosphoric acid and potash certainly suffer a slight diminution, as they are found in the blood, bones, flesh, and products of the animals.

So, then, there need be scarcely any loss of the mineral or ash elements, and only 17 per cent. loss of nitrogen, when the crops are fed on the farm; and the manure is all saved. The great fault in dairying and stock-feeding is that the manure is not all saved. Especially is this true (in American farming) of the liquid excreta, which are usually practically wasted. Farm ers are slow to believe that the urine is richer in plant-food than the solid excreta. But, according to Dr. Wolff's latest tables (extended and averaged), a ton of the average mixed dung of horses, cattle, sheep, and swine contains the following amounts of plant-food. For the sake of comparison, we reduce them to cash value at about the prices now paid in this country for the elements in commercial fertilizers. A ton of the above-named animal dung contains—

Nitrogen	9·4 lbs.,	at 20 cts.	= $1.88
Phosphoric acid	6·2 "	6 "	= 0.36
Potash	4·4 "	6 "	= 0.26
Total estimated value of a ton of dung			$2.50

A ton of mixed animal urine contains—

Nitrogen	22·6 lbs.,	at 20 cts.	= $4.52
Phosphoric acid	0·4 "	6 "	= 0.24
Potash	25·4 "	6 "	= 1.52
Total est. value of a ton of mixed urine			$6.28

And the elements in the urine are in a far more soluble and available form, or much more readily and rapidly become so; so that it appears that the urine is worth a little more than two and a half times as much per ton as the dung. This, of course, varies greatly with different classes of animals, kinds of feed, product or labor furnished, etc.; but the above is the average of many analyses made under varied circumstances and giving equal weight to each class of animals in making the average. The exact proportionate value of the dung and urine per ton of each class of animals, as figured from Wolff's tables, is as follows:

A ton of sheep urine is worth 3·33 times as much as a ton of sheep dung.
A ton of horse urine is worth 3·07 times as much as a ton of horse dung.
A ton of cattle urine is worth 2·62 times as much as a ton of cattle dung.
A ton of swine urine is worth 0·87 times as much as a ton of swine dung.

Of course the comparative quantities of dung and urine for the respective classes of animals will vary inversely as the comparative values; swine, for example, from the usual character of their feed (slops and refuse), voiding a far larger proportion of urine, and the sheep a far less proportion.

These facts should be sufficiently alarming to American farmers. Plainly, the dairyman who saves the dung and wastes the urine (as a majority have hitherto done) is saving his silver and wasting his gold.

But the total weight of the mixed urine of those four classes of animals for a given period of time is less than the total weight of the dung for the same time, and the total value of the urine for a given period is only about two-thirds that of the dung.

Notwithstanding such facts and figures repeatedly published, in substance, in our agricultural books and periodicals, the waste of urine on our dairy-farms in winter is simply amazing. Little straw has been grown for bedding until within a few years, and hence the urine has been voted a nuisance, and permitted, or even encouraged, to leak through the floors. And often even the dung is thrown out beneath the eaves to have its richness washed away, until one is reminded of the manure described by the shrewd and learned author of *Talpa* as carried in "Drychaff's dung-cart, that creaking hearse that bears to the field *the dead body from which the spirit has departed.*"

But within a few years a large proportion of the more enterprising dairy-farmers have begun carefully to save all the manure. Much more grain is now raised on the dairy-farms and fed to the cows. This gives straw and stalks to be worked over for feed, and the refuse used for bedding and absorbents. Then, too, the best dairymen are now making their stable-floors water-tight, with a water-tight gutter about six inches deep by two feet wide behind the cows. Into this gutter the horse-manure and all litter from the adjacent stables is daily placed, and the bedding from beneath the cows constantly works down into the gutter; and together they completely absorb the urine, so that the whole mass can be readily handled with a six-tined manure-fork. The whey from the cheese and the skimmed milk from the butter-making are fed to calves or pigs in places so arranged that their voidings can be saved and mixed with the common stock.

This, in general, is now the practice of the more intelligent and enterprising dairymen in New York, Pennsylvania, and Ohio; and the increasing crops on their farms will in time convince their less careful neighbors of the wisdom of this course.

Manure on Grain-Farms.—In the principal grain-growing regions—as, for example, in Genesee and Livingston counties in New York; Lancaster, York, and Chester in Pennsylvania; and Stark, Wayne, and Miami in Ohio—the manure has for many years been better saved than in our principal dairy-regions. While the main dependence has been placed upon *clover* as a renovating or preparatory crop for wheat (as will be shown farther on), the animal voidings have been better saved. The straw is no longer burned, as formerly and still is in parts of the West, but is carefully stacked in large, warm barnyards, with high, close fence and sheds on the windward side, where during the winter the cattle and sheep find comfortable shelter, and with a small daily ration of grain and clover hay consume large quantities of the straw, and trample the unused parts beneath their feet to mix with and absorb their voidings. The stack is cut down in sections and spread as required for feed or litter, and by spring the great stack is worked down into coarse, strawy manure, rich and available of course in proportion to the number of horses, cattle, sheep, and hogs that have been wintered in or near it, the quantity of straw they have passed through their intestines, the quantity and quality of grain, hay, and mill-feed they have eaten to supplement the straw, and last, but not least, the care with which eaves- and surface-wash and leaching have been prevented.

Grain-Raising and Dairying combined, however, work to the best advantage, not only financially, but also in the production of manure. The cows need the grain and the corn-fodder for feed, and they turn it rapidly into cash and manure. They need the refuse straw and stalks for bedding and absorbent, and they work huge piles of both into the best of manure—best because saturated with their rich voidings.

Of course, the character of soil and surroundings decides whether grain-raising or dairying shall predominate in any given region; but our best grain-growers in our gravelly alluvial plains and valleys are keeping far more dairy cows and establishing creameries and cheese-factories; and, on the other hand, our best dairymen in our drift-clay regions are year by year raising far more grain, especially wheat, on the constantly increasing tile-drained portions of their farms, and are finding they can actually increase the size and product of their dairies, and still devote constantly increasing portions of their farms to grain-growing; for now they have the means of saving and wisely using all the voidings.

Time, Place, and Mode of Applying Manure.—A great variety of opinions and practices exists on this point. It is a case where "circumstances alter cases." It is a question partly of soil, climate, topography, and crops, and partly of time, labor, and convenience. It is to be decided in part by theory, but more by actual results. As a rule, the field or crop that requires or is to have most tillage should be richest, to justify and reward the labor. *Soil.*—As a rule, sandy, gravelly, or other porous soils should have the manure nearer the surface than compact. *Climate.*—If it is subject to sudden extremes in winter, a top-dressing late in fall is seldom wise. When heavy snow covers frozen ground top-dressed late in fall, a sudden thaw with drenching rain sweeps away a large part of the plant-food in solution, or even in suspension, from the frozen ground that cannot drink it in. A hilly or very rolling surface aggravates this evil. *Labor, Convenience.*—As the labor of applying is considerable, it should be done when work is slack and manure and fields in right condition. Many of our best dairymen have stables so constructed as to drive the sled or cart or wagon through, and shovel the manure directly in from the gutter, and draw it each day, or every second or third day, directly to the field on the snow or frozen ground. Here it is either at once spread, or, to guard against wash from the frozen surface (see above), is placed in compact piles in rows and at proper distances, to be spread by hand and pulverized or scattered thoroughly by harrowing just before ploughing it under in spring. In this case some spring crop is raised, and after its harvest the field is ploughed and thoroughly cultivated, harrowed, and rolled in August, thus thoroughly comminuting and mixing the manure, already well decomposed, and placing it where it will at once and constantly be available for the wheat drilled in in September. In the case of corn and potatoes, where the ground has been thoroughly tilled all summer and the weeds kept down, it is considered best not to replough it, but simply to cultivate and harrow before drilling in the wheat.

Composting and Rotting.—Those who have the patent manure-spreading cart usually favor piling and rotting (sometimes composting with muck or turf) the manure until fall, and then distributing it with the spreader either on the ploughed field to be sown to wheat, or on a clover meadow in September, to soak through and through the soil all the fall and winter, putting it in the very best condition for potatoes the next spring, to be followed with wheat in the fall. Rotting and composting thus require more work, and are apt to accumulate work in the busy season; and there is danger of loss of ammonia in rotting. By applying directly from the stable in winter labor is saved, the work comes in the slack season of the year, the mechanical effects, especially on clayey soils, of ploughing under coarse, strawy manure are excellent, and there is probably, on the average, less actual loss of ammonia and soluble potash and phosphoric acid than where the manure is rotted through the summer in large compost-heaps.

Green Manuring is practised to some extent in the grain-regions. For example, a vigorous growth of clover is ploughed under in May, and the ground is planted to corn or Irish potatoes, to be followed the same fall by wheat or the next spring by potatoes again or barley or oats, and the fall after that by wheat, to be seeded the next spring with clover and timothy. Then this is mowed or pastured one or two years, and then ploughed under again, and the rotation goes on as before. Or sometimes even a heavy first crop of clover is ploughed under, in or just after full bloom in June, and the ground is fallowed till fall, and then sown to wheat; one full year's growth being thus sacrificed for the good of the wheat. Or sometimes the first crop is mowed for hay, and a heavy second crop is ploughed under in August, and the ground sowed to wheat in September. Buckwheat and millet are also used to a limited extent to plough under as green manures. But clover in the Northern States, and pease at the South, especially near the South Carolina phosphate deposits, are regarded with great favor as the great renovating crops—the crops best adapted to collecting and storing available phosphoric acid, and especially nitrogen, for wheat and other succeeding crops. The acreage of clover ploughed under for manure is, however, diminishing, as it is found that it pays better, except where land is very cheap or labor very high, to feed the clover in some way, and turn part of it into wool, meat, lard, or butter, and still save nearly all the most essential and most easily exhausted elements of plant-growth upon and in the soil in the voidings of the animals fed. For, as already shown, over 83 per cent. of the total nitrogen contained in hay and grain, and practically all the ash-elements, are left in the mixed voidings of the farm animals that eat the feed. And so it seems wiser to turn the feed-value of the clover into cash for the above animal products (wool, butter, etc.), and save the manure-value in their voidings, rather than to plough under the food fit only for animals with that fitted for plants, and thus waste it almost entirely.

The offices of clover are coming to be fairly well understood, though extravagant claims are still made for it, as if it could make something out of nothing—*create* fertility that did not exist. The large, long roots indeed bring up the mineral elements from deep down, and help to store them as well as the carbonaceous, and to some extent the nitrogenous, elements of earth and air, in available condition and position to promote the growth of future crops. Clover seems to be the great scavenger of agriculture—a gross feeder, capable of collecting the nitrogen and the phosphoric acid of the soil held in insoluble forms or in solutions too dilute for the roots of cereals to thrive upon them, and by the decay of the large clover-roots storing these elements in large quantities and available forms near the surface, where the young roots of cereals can at once and continuously find and use them. Dr. J. G. Holland makes a certain Irish character in one of his novels say in substance, "The pig kin ate wot there can't nothin' else ate, and then you kin ate the pig." This seems to be the office of the clover—to eat what the wheat can't eat, and then die and let the wheat eat it.

Clover is commonly classed among the "enriching" or "renovating" crops, as contrasted with the "non-exhausting" ones, like pease, beans, and cereals cut green; or with the "exhausting" crops, like the ripened cereals, potatoes, etc.; or the "very exhausting" ones, like flax, hops, tobacco, etc. It is indeed a renovating crop in the sense and for the reasons given above, but there is no proof that it is an "enriching" crop in any such sense as to imply that it adds mineral elements (or even nitrogenous ones, appreciably) to the great sum-total in air and earth. Dr. Voelcker in the *Journal of the Royal Agricultural Society* as long ago as 1868 gave it as his opinion, based, as he himself says, on presumptive evidence, "that the ammonia and nitric acid of the air, descending with the rain, ordinarily satisfy the requirements of the clover-crop." But his experiments were tried on soils already rich in nitrogen, and subsequent science has failed to confirm his opinion. It has shown that in latitudes and climates like ours only from 3 to 7 pounds per acre of nitrogen as nitric acid descends to the earth each year in rain and dew, and perhaps from 5 to 15 or 20 pounds of all the ammonia compounds, and that even these are probably emanations from decay in the soil itself, the average total annual additions to the acre being from 10 to 15 pounds, or even less. But, according to Dr. Voelcker's own figures, based on many analyses, the roots of a heavy clover-crop contain 100 pounds of nitrogen per acre, and the hay (2½ tons first crop, and 1½ tons second) contains some 224 pounds—a total of fully thirty times the annual net amount now believed to be added to the soil from the air. Indeed, when we consider the wastes in drain-water and surface-wash, and from volatilization, it seems probable that the *net* gain may be much smaller. Dr. Voelcker elsewhere in the same remarkable paper says, "During the growth of the clover, nitrogenous food, for which wheat is particularly grateful, is either stored up or rendered available in the soil." Apparently, 10 pounds, more or less, is stored up, and 314, more or less, is simply rendered available —slowly available, however.

Now, the nitrogen of the soil, contained chiefly in its vegetable mould or humus, came, it is true, originally from the air. But it is the slow accumulation of the growth and gradual decay of a scanty, primitive, and slowly ascending vegetation for untold ages and millenniums before man began to exhaust the accumulations by *tillage and removal;* so that these slowly-gathered stores of humus furnish our sole practical supply of nitrogen for plants. For science with its most delicate tests has failed to show that the leaves of plants, though they drink in carbonic acid eagerly, do or can absorb any nitrogen in any form, except through their roots in the soil. Bathed in an atmosphere four-fifths of which is free nitrogen, the leaves cannot drink an atom of it.

Not only is clover not an "enriching" crop, properly speaking, but, as shown by Dr. Voelcker's experiments already cited, it is one of our most exhausting ones. He shows that a hay-crop of it removes from a given area more than twice as much phosphoric acid, and more than three times as much nitrogen, as the grain and straw of a crop of wheat under the same circumstances. Apparently, then, all that can be said is that clover is so gross a feeder, so thorough a scavenger, so successful in rendering available in character and position (location) the mineral and nitrogenous elements already in the soil, and in conserving and saving from waste the scanty nitrogenous ones added to the soil in dew and rain, and lays up so large a store near the surface in its roots, those great inverted cones, that even when one, or even both, the hay-crops of the summer are removed, the roots and stubble remaining and decaying in the soil furnish large stores of the very food the wheat-plant needs.

But it should never be forgotten that clover is really a most exhausting crop, and that ultimate soil-exhaustion below the point of profitable cereal production will be reached even sooner with than without clover, if the hay-crops are removed from the field or farm without adequate manure-return. The oftener the clover pumps the soil to collect available food for wheat, the sooner will the wheat that follows it exhaust the ultimate supply. Not only is this probable *a priori*, but it is true in actual experience. We know by sad experience—and our fathers learned it too—that the soil after a while becomes "*clover sick*;" that is, it will not even grow clover successfully, much less wheat. The springs of fertility have been drained so low that not even clover can pump up any more until more has slowly gathered or developed in the soil, or the pump (clover) has been "primed" with an application of nitrogenous matter.

Dr. Voelcker's experiments seem to show simply that wheat rapidly exhausts the stock of nitrogen already available for cereals, while clover tends, somehow or other, to make it available. But it seems now essentially agreed that the actual yearly additions of available nitrogen from air to soil (where alone they can be used) are almost infinitesimal compared with the yearly demands of our present vegetation under cultivation and removal.

And so there seem to be two points well settled: first, we shall rapidly exhaust our soil if we grow clover and sell or remove it; second, we may maintain, and even slowly increase, the productiveness at least of our soil if we grow clover and feed it wisely on the farm. This, however, implies tile-drainage where it is needed; thorough tillage; the careful saving and wise use of all the roughage of our crops, and of all animal voidings, both liquid and solid; the sale chiefly of condensed products, such as meat, butter, wool, and flour, not wheat; and the judicious purchase back again in commercial fertilizers of some of the nitrogen and phosphoric acid that inevitably leave our farms even in the most condensed products. Fertility maintained and increased otherwise is either mere delusive present productiveness, or is obtained at the expense of others, as England, for example, increases her fertility by buying the wheat and mill-feed we are foolish enough to sell.

One form of green manuring common in Europe is scarcely known here—viz., the growing of turnips and other root-crops to be consumed on the ground by sheep.

Liquid Manuring is little practised here, owing partly to the expense, and partly to the belief that the distribution of elements is more perfect and the effects are better when the urine is absorbed and used with the dung. Nitrogen and potash predominate in the urine, and phosphoric acid in the dung. Hence the wisdom of applying them mixed.

Commercial Fertilizers.—This term is now commonly used to include such manures as contain in condensed form, and from sources foreign to the individual farm, one or more of the three elements needed by plants and most likely to be deficient in soils long under tillage—viz., *nitrogen*, *phosphoric acid*, and *potash*. (For a fuller consideration of the subject, with the processes, etc., see article FERTILIZERS.) (W. I. C.)

CHAPTER V.

CROPS.

1. CEREALS.

Under the head of "Cereals" are classed those plants whose grains are used by man for food, and which may be termed "bread-producing plants." With the exception of buckwheat, they all belong to the grass family, and include maize or Indian corn, wheat, rye, oats, barley, rice, and millet. These are the most important. The term "corn" is sometimes used to embrace all these grains, but in America this word is applied only to maize or Indian corn.

There are a few other cereals less known, limited in the extent of their culture and used by some savage tribes. *Eleusine coracana* and *E. stricta* are cereals of some value in India, as they are largely used for food when there is a failure of the rice-crop in that country. "Natchnee," "nagla raggee," and "mand" are native names for this grass. Along the West Coast of Africa *Paspalum exile* produces a fine-grained corn called "fundi" or "fundungi." The native corn-plants of Abyssinia, "teff" and "tocusso," are *Poa Abyssinica* and *Eleusine Tocusso*. In North America the Indian tribes of the North-west feed largely upon the grains of wild or "Indian rice," *Zizania aquatica*. The plant grows in shallow water, and the Indians obtain the seed by paddling a canoe among the tall stems, which they draw down with a hooked stick and beat off the grain into the canoe.

In the United States in 1880 the total number of bushels produced of the five leading cereals, maize, wheat, barley, oats, and rye, was 2,703,575,966, valued at $1,352,815,216. In 1881 the total number of bushels was 2,056,543,370, and their value was $1,462,742,495.

WHEAT.

Wheat holds the first position among the cereals valued for food, although in point of money-value Indian corn takes precedence. No plant in the entire vegetable kingdom is more intimately connected with the history and progress of civilized man or more essential to his higher social requirements. The grain contains the largest percentage of those elements most necessary for food, and in proportions best suited to man's physical needs.

The following table shows the composition of the entire grain, the grain freed from bran, and the bran alone:

Elements.	Entire wheat.	Wheat freed from bran.	Bran alone.
Moisture.	10·40	10·60	8·93
Ash	1·15	1·45	2·55
Oil	2·45	2·27	1·72
Sugars, etc	3·61	2·88	5·42
Gluten	3·94	4.05	·55
Gum	1·54	1·14	·86
Starch	67·24	68·46	59·00
Albumen	7·96	8·01	5·99
Fibre	1·71	1·14	15·01
	100·00	100·00	100·00

The comparative food-values of these parts are, for the entire grain and for the kernel freed from bran, 1·32; that of the bran alone, ·98. Although the separation of the bran may remove a portion of the bone-forming elements, it does not diminish the nutritive value.

In the earliest histories of the human race wheat is mentioned as a food-plant, and had a purchasing value. In Europe it was cultivated prior to all historic periods, as grains of it have been found among the ruins of the Lake-dwellings of that country.

That wheat is of Eastern origin there is no question, but its native country is unknown, and it is even a matter of speculation whether it ever existed in a wild state in its present form, some supposing it to have been produced from the long-continued cultivation of a wild grass (*Ægilops ovata*) native to the borders of the Mediterranean.

The Spaniards introduced wheat into America during their conquest of Mexico, about the year 1530. From a small beginning the cultivation of the plant soon spread throughout the Spanish settlements of that region, including a portion of the territory now forming a part of the United States. Emigrants from the Eastern States found the Indians of New Mexico successful wheat-growers, and to-day the Pima tribe in Arizona raise a surplus of this grain, which they sell to the white traders and Government officials. Gosnold planted wheat in New England in 1602, and in 1611 it was introduced into Virginia, where in 1648 several hundred acres were devoted to its culture. In 1750, New Jersey stood first among the wheat-growing colonies of America. A century later, Pennsylvania headed the list with a crop of 15.000,000 bushels. From this period the growth of wheat-culture in America has been most remarkable, and is chiefly due to the development of the wonderfully fertile and wide-extending lands of the upper Mississippi Valley, where nature seems to have especially prepared the soil for the growth of this plant. The following table shows the extent of the increase in production in the West. The first section includes the Atlantic States, with Pennsylvania and the Virginias, to the Ohio River; the second and third are separated by the Mississippi River:

Section.	Produce in bushels.			
	1849.	1859.	1869.	1879.
Atlantic coast.	51,657,020	58,294,137	57,476,371	58,701,531
Central belt.. ..	43,522,646	94,458,609	114,087,070	229,265,180
Trans-Mississippi belt...	5,306,278	25,352,178	89,392,185	171,512,794

The wheat-crop of the United States and Territories in 1879 (the yield of that year being the one which appears in the census of 1880) amounted to 459,479,505 bushels. California produced 29,017,701 bushels; Illinois, 51,110,502; Indiana, 47,284,853; Iowa, 31,154,205; Michigan, 35,532,543; Minnesota, 34,601,030; Missouri, 24,966,627; Ohio, 46,014,869; and Wisconsin, 24.844,689 bushels. This list comprises all the States which produced over 20,000,000 bushels. The amount raised *per capita* for the same year was 9·19+ bushels, and the average price per bushel 95·1+ cents.

In 1880, in the United States, 37,986,717 acres were devoted to wheat; the total production was 498,549.868 bushels, and the value of the crop $474,201,850. This was the highest production yet attained. In 1881 the area cultivated was nearly the same (37,709,200 acres), but the production was the smallest since 1877, being only 380,280.090 bushels, and its value $453,790.427. The average yield per acre was 10·1 bushels, the lowest ever reported, while the average price rose to $1.19 per bushel, being the highest since 1872. Four States had a production of more than 30,000,000 bushels each—Ohio standing first with 38,520,000; then Minnesota, California, and Indiana; three others exceeded 20,000,000 bushels—Illinois. Michigan, Missouri; and Kansas had 19,909,000. The annual average production for the eleven years 1871–1881 was 342,224,776 bushels, the average area 28,052,480 acres, the average value of crop $359,654,528; the average yield per acre being 12·2 bushels, and the average value per bushel $1.05.

The following table embraces the cities of the United States most largely engaged in wheat-traffic, with the amounts of their receipts and shipments:

Cities.	Wheat.		Flour.	
	Receipts.	Shipments.	Receipts.	Shipments.
Baltimore, Md	34,319,638	31,970,745	1,333,232	448,359
Boston, Mass	5,967,809	5,214,293	2,029,353	618,296
Buffalo, N. Y	37,788,501	....	897,115	
Chicago, Ill	34,106,109	31,006,789	3,369,958	3,090,540
Cincinnati, O	3,854,722	3,383,387	613,914	398,653
Duluth, Minn	....	2,754,356	....	511,942
Indianapolis, Ind	8,802,708	7,715,750	1,425,000	1,541,800
Kansas City, Mo	6,417,952	6,099,033	143,068	143,960
Milwaukee, Wis	19,649,352	15,060,222	2,424,673	2,983,439
Minneapolis, Minn.	4,788,550	20,200	33,200	935,544
Montreal, Can	11,313,634	10,461,221	771,384	725,109
New Orleans, La	3,128,914	2,796,669	619,461	40,230
New York, N. Y.	71,246,796	62,682,774	5,639,079	4,287,541
Philadelphia, Pa	20,079,600	16,814,572	886,880	201,818
San Francisco, Cal	19,146,468	17,549,851	559,579	510,948
St. Louis, Mo	17,093,362	7,302,076	1,607,236	3,045,035

The cities of the Union most largely engaged in wheat-traffic are Baltimore, Chicago, Milwaukee, New York, Philadelphia, and San Francisco. The shipments from New York are more than double those from Baltimore, the second city in the scale, Chicago standing third. New York is also first in its shipments of flour, Chicago second, and St. Louis third.

The value of the combined exports of wheat and flour from the United States in 1850 was $7,742,315; in 1860 it was $19,525,211; in 1870 it had increased to $68,340,822; while in 1880 the value of this export amounted to $225,879,502, or $218,137,187 more than that of 1850. This show of increase is not exactly fair, as the value of the exports for 1850 was much smaller than for either of the four preceding years.

The production of this cereal in some of the other countries of the world is tabulated below (the general average yield and the yield for 1879 are both given):

Country.	Average annual yield.	Yield in 1879.
France	289,500,000	229,230,000
Russia	226,400,000	198,100,000
Germany	124,520,000	113,200,000
Spain	118,860,000	99,050,000
Italy	110,370,000	84,900,000
Austria-Hungary	104,710,000	79,240,000
Great Britain	104,000,000	59,430,000
Turkey in Europe	42,450,000	36,790,000
Roumania	33,960,000	28,300,000
Belgium	24,055,000	18,365,000
Algiers	25,470,000	21,225,000
Canada	16,980,000	16,980,000
Australia	18,395,000	22,074,000
Egypt	16,980,000	14,150,000

Russia, Austria-Hungary, Turkey in Europe, Australia, Canada, Algiers, and Egypt have a surplus for export; France, Germany, and Spain in an average year raise enough for the home-market; while Great Britain usually imports 100,000,000 bushels. In 1879, Australia had 2,750,000 acres under wheat—two and a half times the area in this crop at the close of the previous decade. The cultivation of this grain in South America is increasing rapidly, and already there is a small export of wheat from some of the more prosperous states.

Varieties of Wheat.—The long cultivation of wheat and the desire of agriculturists to improve the grain have resulted in the production of a host of varieties, many of which possess only a local reputation. New varieties are constantly being produced that are extolled for their productiveness, early ripening, freedom from disease, hardiness, or some other quality commending them to the wheat-grower. The majority of these have an ephemeral existence, and the best-known varieties of to-day will in a few years be supplanted by others, or if still cultivated appear under new names. Some success has been attained in the production of hybrid varieties. The more apparent outward characters of difference presented by the more important varieties are manifest in the size and length of the straw; in the appearance and nature of the chaff, size of head, color and size of the grain, and the length of the beard. In the so-called "bald wheats" the awn or beard is entirely wanting. The difference between the spring and winter wheats is purely a physiological one—the less hardy, and especially the early-maturing, sorts are spring wheats; the more vigorous, and those requiring a longer time for development, constitute the winter varieties. By a careful system of culture the one may be converted into the other in a few seasons. The character of the soil and the nature of the climate have much to do in the changing or making of varieties. The varieties of the Eastern States when grown in California soon lose their distinctive characters and assume those belonging to that region, or what is called "the California type." "Soft" wheats sown in regions adapted to the growth of the hard-grained sorts, and where these are largely cultivated, will gradually come to possess the flinty character of the latter. The varieties of wheat are separated into two classes by the miller—the "soft-" and the "flinty-" grained wheats. The latter are much preferred for milling purposes, being more easily manipulated than the former. The soft wheats are usually selected for the manufacture of starch, as they contain the greater percentage of this substance, the flinty wheats being richer in gluten, and hence more valuable for flour. In commerce but four varieties of wheat are known—spring, red and amber winter, and white wheat. On the Pacific coast the varieties having a market quotation are "California" and "Oregon" wheats, the former usually commanding the higher price. The market quotations in New York in Nov., 1881, were as follows:

White wheat of all kinds,	$1.25	to	$1.42½	per bush.
Red and amber wheats.....	1.00	"	1.45	"
Spring wheat....................	1.05	"	1.41	"

In 1880 the quotations showed a greater difference in favor of the red and amber wheats.

The following list comprises some of the more prominent varieties known to the American farmer: "Lost Nation;" "Tappahannock;" "Lancaster red chaff;" "Genesee;" "Canada;" "New York;" and "Turkish flint;" "Diehl;" "Clawson;" "Fultz;" "Red Mediterranean;" "Odessa red;" "Golden chaff;" "Silver chaff;" "Boughton;" "Early May;" "Defiance;" "Improved Fife;" "Russian white;" and "Victor." The most popular varieties on the Pacific coast are the "White Australian" and the "Red" and "Mold's white" wheats. In New England and in the North-west the spring wheats are those chiefly cultivated; in the Middle, Central, and Southern States winter wheats predominate.

The following table gives the chemical composition of five American varieties of spring and winter wheat:

Constituents.	Improved Fife (Spring wheat).	Mold's white (Winter wheat).	Champlain (Spring wheat).	Defiance (Spring wheat).	Silver chaff (Winter wheat).
Water..........................	8·50	8·64	8·79	8·12	8·93
Oils..............................	2·56	2·32	2·55	2·49	2·44
Sugars..........................	3·37	3·12	3·61	3·50	3·79
Albuminoids soluble in alcohol.	4·69	1·07	4·45	4·10	2·70
Albuminoids insoluble in alcohol.	10·01	8·56	10·95	9·90	7·19
Gum............................	2·46	3·38	2·12	2·27	2·54
Cellulose......................	1·62	1·63	1·49	2·04	1·75
Ash..............................	1·47	1·64	2·05	1·57	1·58
Starch, by difference..	65·32	69·64	63·99	60·01	69·08
	100·00	100·00	100·00	100·00	100·00

It is in keeping that a plant so important to the human race as wheat should grow and be productive on soils of the most varying character. It withstands a great diversity of climate, and there are few farms in any State of the Union that will not yield a profitable crop when rightly tilled. The differences which appear in the suitability of the soil or climate of some regions over those of others may be in a great measure overcome by a careful selection of varieties or a modified system of agriculture. The varieties most popular in the New England States are scarcely known beyond their limits, and those most extensively cultivated in the Middle States give place to others in the South and West, and the leading wheats of the Pacific Slope are almost unknown east of the Rocky Mountains.

The composition of the ash of the wheat-plant shows those elements which must come from the soil:

Average of Fifteen Analyses, as published by Johnson.

Potash..........................	11·5	Phosphoric acid......	5·3
Soda.............................	1·6	Sulphuric "	2·5
Magnesia......................	2·5	Silica.........................	69·1
Lime.............................	5·8	Chlorine.....................	1·1
Oxide of iron...............	0·7		

Wheat-Culture.—Under this head the following topics must be considered: Preparation of the land and the application of fertilizers; selection of seed and preparing it for sowing; time and manner of sowing; cultivation of the growing crop; and, finally, harvesting.

It is essential to the success of all subsequent operations that the land be thoroughly drained, and there is no system of culture that can remedy a failure in this first and most important step in the preparation of the land for wheat. The ploughing, which is best done in August, should be deep, using a subsoil plough on the heavier lands. For spring wheat the ploughing is done either in the fall or early spring. Fall ploughing is preferred, as it gives an opportunity for the decomposition of the turned sod or stubble, and the germs of weeds or the larvæ of insects brought to the surface are more likely to be destroyed by the frosts of winter. A second ploughing is sometimes necessary to reduce the soil to a proper condition, and some farmers invariably make this a practice, affirming that the increased yield more than pays for the extra cost and labor. The soil must be well pulverized with the harrow and roller; and the more perfectly this is done the more readily will the roots of the plant find the nourishment they seek, and the less will be the waste of the food-elements contained in the soil. Where the application of fertilizers is required, it is important that those kinds should be selected which contain the elements required by the plant which are absent from the soil. These elements may often be present in the land, but in combinations requiring the application of some alkali to reduce them to a soluble and available form. There is no better fertilizer than barnyard manure, and this is always used when obtainable. It is a very common practice to plough under a clover sod in preparing land for wheat. The decomposition of the plants supplies a rich fertilizer, and the action of clover-roots on the soil renders it more friable and assists in its comminution. When not sown upon the sod, wheat usually follows corn; the thorough culture and free application of manure required for the latter crop bring the land into excellent condition for wheat.

Great care should be exercised in the selection of the seed, not only as regards the variety, which has already been alluded to, but in respect to the character and quality of the seed itself. Mr. D. S. Curtiss, in speaking of this subject in his *Treatise on Wheat-Culture*, says that the seed should be perfectly ripe, "gathered, thrashed, and binned without the least wetting or moulding, and without being cracked or heated in the lightning thrasher; it should be perfectly screened and cleaned in the fanning-mill. Farmers would, in the long run, be the gainers if they would each year gather with the grain-cradle, and thrash by hand with the flail on a clean barn-floor, sufficient wheat for seed, selecting the best growth in the fields, and letting it stand until perfectly ripe, taking that which seems to be the earliest ripening. When ready to plant soak the seed for six hours or more in brine and roll in plaster to dry it for the drill."

The season for sowing winter wheat begins in September, and in the South extends into November. Spring wheats are sown as early as the land is suitable for working. Sowing broadcast from the hand—a custom as old as the cultivation of the grain itself—is still practised in some parts of the country, more especially in those sections where spring wheats are grown and in the cotton States. Machines for sowing broadcast are still in use, but since the introduction of the drill its use has become general in the Middle and Western States. The advantages of drilling over other methods is so great that the use of the drill has grown rapidly into favor. By its use the grain is more evenly distributed and covered to a more uniform depth; the yield for a given quantity of land and seed is increased, as there is more room for tillering; weeds may be more easily got at and removed, and opportunity is afforded for the dislodgment of insects or for the application of remedies for the destruction of these pests, as well as for the prevention of disease; and, finally, the crop is more cheaply and easily harvested. In Japan the planting of wheat in drills has been practised for ages. There the operation is done by hand, and crops of vegetables are cultivated between the rows of wheat. The cultivation of the growing wheat was practised by the ancient Romans, and this system is now quite general in European countries and in Great Britain, but in America it is as yet confined to a few experimenters. Horse-hoes and cultivators are now made for the cultivation of drilled wheat, and their use is growing in favor.

Mr. John Heiges of Pennsylvania has experimented largely in the growing of wheat with the view of determining the value of cultivating the growing crop. He prepares his land by manuring and ploughing early in August; then about the middle of September ploughs again, running the furrows a little deeper this time (10 inches). The land is then thoroughly pulverized by harrowing. The wheat is planted in "scores," from 5 to 8 inches wide, made with a garden-hoe or double mouldboard cultivator, leaving the ridges between the scores about 10 inches wide. The grain is sowed broadcast in the scores in the latter part of September, and covered with a rake. The cultivating and hoeing is done in April, and again in May. The yield under this system was double that produced from a crop that had been drilled in the ordinary manner, soil and other things having been equal. A yield of from 50 to 60 bushels was obtained by this system of culture. An experiment was made with a pound of European seed, planted in the fall on the fifty-sixth part of an acre, hoed once in April, and again on the 3d of June. Before each hoeing phosphate of lime and wood-ashes were scattered between the rows. The product from this 1 pound of seed amounted to 1 bushel 9 quarts and 1 pint of good wheat, or a yield per acre of 71 bushels. Mr. Heiges thus sums up the advantages of this method of culture: 1st. More space is occupied by the seed, giving the plant a better chance to take root, each grain occupying a separate space, and not confined in the V-shaped furrow, as with the drill, all the seeds being scattered on a level bottom, giving to each stalk an equal chance, so that there are no short stalks and no small heads. 2d. The cultivation breaks the hard crust caused by the snow and rain during the winter months, thereby opening the soil to the influences of air, warmth, and moisture when the young plant most needs such influences. 3d. The space left between the wheat for cultivation leaves an opening for air and sunlight. 4th. It seems to withstand the effects of severe winter and early spring weather, being less liable to winter-kill than when drilled. The extra cost per acre of cultivating wheat after this mode is not over $2 more than with the drill.

The *American Agriculturist*, in recounting the experiments of Mr. Travis of Michigan, states that 68 pounds of seed per acre were sown in drills 16 inches apart, and 90 pounds per acre in drills 8 inches apart, September 8th, on sod ground ploughed September 1st. That in the 16-inch drills was cultivated with the Travis wheat-hoe once in the fall and twice in the spring; the other was not cultivated. The wheat planted in the 16-inch drills did not lodge or crinkle down, while that in the 8-inch drills did so badly (probably to some extent the effect of the Hessian fly). The average yield was 69½ per cent. greater in the 16-inch drills than in the 8-inch. Where in some of the 16-inch drills the quantity of seed was only 3 pecks to the acre the stand was as thick as where 64 pounds were sown. The quantity of seed required per acre varies with the condition of the soil, the manner of sowing, and the variety grown. The following are the quantities generally used:

Winter wheat,	sown	broadcast,	1¾	bushels per acre.
"	"	in drills,	1-1½	" "
Spring wheat,	"	broadcast,	2-2½	" "
"	"	in drills,	1½-2	" "

Much smaller quantities have been used with success by experimenters. A wheat-grower in Colorado states that he sowed 12 bushels of Siberian spring wheat on 17 acres of land April 10th, on ground ploughed in the fall. There was no irrigation. The grain was harvested August 9th, and the yield was 930 bushels, or almost 55 bushels to the acre.

Mr. George Wilkins (English), writing for the *Gardener's Chronicle*, states that for fourteen years in succession he had never used more than 2 pecks, or 16 quarts, to the acre, and the average yield for the whole time was 44 bushels to the acre. The land was thoroughly drained and the seed was sown in drills in the fall.

The season for harvesting wheat (the winter varieties) is about the 1st of July, but, as with sowing, the season varies with the latitude (the time given is that for the Middle States). Reaping the grain with a sickle is the most primitive method, and is practised still in a few countries of the world, and even in some of the less advanced states of Europe. The sickle is rarely seen in America, the cradle taking its place when the harvesting is done by hand, as in the Northern States, where the condition of land is unfavorable to the use of machinery, and by small wheat-growers generally. Reaping-machines are used by all who grow this crop extensively, and the farmer by the aid of one of these reapers, which have been brought to a wonderful state of perfection, is enabled to harvest his fields of grain, often amounting to thousands of acres, with ease and expedition. Spring wheat is usually ready for harvest in August. Cutting the wheat at least a week or ten days before it is fully ripe is always recommended and generally practised. The scattering of the grain, which in some varieties is often considerable, is thus avoided and the yield made larger, and the value of the product is not impaired. In fact, the flour is finer and whiter from early-cut wheat than from that which is allowed to come more fully to maturity, but the proportion of starch to gluten is greater, so that the food-value is perhaps less.

After the wheat is cut and sufficiently cured, it is stored in the barn by those who possess buildings large enough to hold their crops, or stacked upon the field to await the thrasher. The flail may be used in obtaining seed-wheat or in thrashing small lots. Horse-power machines, owned by parties who travel from farm to farm and thrash the small quantities raised, are in general use in New England. Steam is substituted for horse-power where the crops are large. (For a more particular account of the use of reaping- and thrashing-machines see AGRICULTURAL MACHINERY.)

The estimated cost of raising and marketing an acre of wheat on the majority of farms throughout the country is $10.

Wheat-Culture in California.—The soil and climate of California are exceedingly favorable to the production of wheat. In the fertile valley of the San Joaquin this grain has been grown on the same soil for more than fifty successive years without any apparent falling off in the yield. Here are to be found the largest wheat-fields of the country, sometimes embracing 40,000, or even 50,000, acres of land. Another remarkable thing in regard to California wheat-growing are the "volunteer" crops. Mr. Benjamin Ely of Yolo county reports to the U. S. Department of Agriculture that he laid down 45 acres to wheat in 1865, and afterwards harvested five successive crops without sowing, ploughing, or harrowing after the first season; but hogs were turned in on the stubble-ground. The field averaged 35 bushels per acre yearly for the five years, and in the sixth year produced a good crop of hay. It is quite common in California to raise both wheat and barley as a hay-crop. The following graphic account of wheat-culture in California is taken from Prof. E. W. Hilgard's paper on the agriculture and soils of that State, published in the *U. S. Agricultural Report* for 1878:

"The preparation of the ground for the crop on the large wheat-farms is usually made by means of gang-ploughs with from two to six shares, drawn by from three to five horses or mules, three animals very commonly walking abreast. At the critical season it is not uncommon to see half a dozen such implements and teams at work in a single field, closely followed by a wagon carrying seed-grain and the centrifugal power, which showers the grain upon the fresh-turned furrows in strips thirty or more feet wide. Before the day ends the great (usually flexible) harrows have also performed their work, and 30 or 40 acres of what was stubble-field in the morning have been converted into a well-seeded grain-field. Of late, appliances for seeding and covering have been attached to the gang-ploughs themselves, so that the whole task is performed in one operation—certainly the perfection of labor-saving machinery. Seed-drills are as yet in but limited use. . . . During the rainy season the covering is often done by rolling alone, and on harrowed ground the roller is frequently used later in the season in order to compact the surface, so as to mitigate the drying effect of 'northers.'

"In the grain-harvest (which begins the second week in June) the 'wholesale' mode of procedure is equally prevalent. The scythe is used only to cut the way, and that on small farms; then follows the reaper, hired if not owned by the farmer himself. But the binding and shocking process that is to succeed is far too slow for the large grain-grower who has his hundreds, and sometimes his thousands, of acres to reap within the short time allowed by the exceedingly rapid maturing, which threatens him serious loss by shedding, the air being at that season very dry even at night. His implement is the giant header, pushed into the golden fields by from four to eight horses. Its vibrating cutters clip off the heads with only a few inches of straw attached on a swath 16, and even 28, feet wide, while the revolving apron carries the laden ears to a wagon driven alongside, and having a curious wide slanting bed for their reception. Several of these wagons drive back and forth between the swaths and the steam-thrasher, where within half an hour the grain that was waving in the morning may be sacked ready for shipment to Liverpool. Even this energetic mode of procedure, however, has appeared too slow to some of the progressive men in business, and we have seen a wondrous and fearful combination of header, thrasher, and sacking-wagon moving in procession side by side through the doomed grain. . . . Where farming is not done on quite so energetic a plan the reaped and bound grain, being at that season perfectly safe from rain, is left either in shocks or stacks until the thrashing-party comes around, mostly with a portable engine, often fed with straw alone, to drive the huge separator, whose combined din and puffing will sometimes startle late sleepers as it suddenly starts up in the morning from the most unexpected places. Two wagons, usually aided by some 'bucks' (a kind of sledge-rake, which also serves to remove the straw from the mouth of the thrasher), feed the devouring monster, and in an incredibly short time the shocks and stacks are cleaned away, and in their stead appear square piles of turgid grain-sacks and broad, low hillocks of straw."

Wheat-Culture in New England.—Here probably seven-eighths of the wheat sown is spring wheat. The land is ploughed in the fall or early spring and "dressed" with barnyard manure, or, when this cannot be had, with some artificial fertilizer, either just before the ploughing or more commonly just previous to the final preparation of the land for the seed. As soon as the land is sufficiently dry the "dressing" is well harrowed in and the wheat sown—almost always broadcast—harrowed, and, after the sowing of the grass-seed, bushed or rolled. The average yield per acre is greater in New England than in the great wheat-regions of the West, but the cost and labor of production are also greater. The growing of winter wheat in New England has proved successful with those who have thoroughly understood the culture of the plant.

Mr. Levi Bartlet of Warner, N. H., reports to the Department of Agriculture that he has grown winter wheat on inverted timothy sod, on clover ley, after oats, and wheat after wheat, and has been led to conclude that fall-sown wheat is as sure a crop in New Hampshire as in any other State in the Union. Concerning his method of culture, he writes that "if I sow after clover, I mow the first crop early or while in blossom. Between the 1st of August and the 20th of September with a good plough completely invert the sod, burying the second crop of clover as far as possible; then pass a heavy roller over the inverted sod, which closely packs the furrow-slices, facilitates the cartage of manure over the land, and prevents the tearing up of the sod in the after-culture with the cultivator or harrow. Apply from twelve to twenty cartloads of manure per acre, using a large, heavy cultivator in burying the manure and pulverizing the soil. Sow about 1 bushel of seed to the 100 rods of land. Generally soak the seed before sowing in strong brine, and after draining dry or separate the wheat by mixing newly-slaked lime with it. When I have thus washed and limed the seed I have never harvested smutty wheat, while some of our farmers who have sown 'unwashed' seed have some years reaped very smutty crops. . . . I sometimes roll the ground after sowing, at other times have not. The grain is surer to come up where the roller is used to finish off. I generally sow timothy-seed with the wheat, and clover the following spring, and have never failed in obtaining good crops of grass in this way. I have found it better to apply the manure on the inverted furrows than to plough it under."

Wheat-Culture in Japan.—The system of wheat-culture in Japan is peculiar, and presents some points that may be of value to American wheat-growers. The Japanese plant their wheat in November in drills 16 inches apart, using 5 pecks of seed to the acre. In three or four weeks a row of pease, turnips, onions, cabbage, or some other kind of vegetable is planted between these drills, and then the wheat is regularly hoed and irrigated with the vegetables. In April or May the wheat is ready to harvest. It has a short but, compared with the straw, a heavy head. The stalk seldom grows higher than two feet, and often not more than twenty inches. . . . The Japanese farmers claim that the straw of their wheat has been so dwarfed that no matter how much manure is used it will not grow longer, but that the length of the wheat-head is increased. . . . On their richest soils and with the heaviest yields the wheat-stalks never fall down and lodge on the ground, to the great injury of the crop, as in the United States. The cutting of the grain is done with a sickle; it is then bound into bundles, and thrashed or shelled at any convenient season by drawing the heads of a small handful through a rude hetchel. The estimated cost of raising an acre of wheat is $11.60, including interest on value of land at 10 per cent. The average yield per acre is 12½ bushels, which are valued at $18.75, making the profit per acre $7.15. The profit on the vegetables cultivated in connection with the wheat must be added to the above in summing up the entire profits of the land tilled. The same land between the harvesting and sowing again is occupied with upland rice and summer vegetables, greatly adding to the profits from the land for the entire year. The drain upon the soil in producing this series of crops—12½ bushels of wheat, a crop of upland rice, and two full crops of vegetables—must be very great, and must be a source of wonder to American farmers. But more wonderful still is the fact that this same land has been tilled in this way and subjected to this enormous annual drain for more than fifteen hundred years without any diminution in the amount of the products. (The above facts are drawn from a paper published in the report of the U. S. Department of Agriculture for 1873, on the agriculture of Japan, by Hon. Horace Capron.)

Uses.—Wheat is primarily grown for the production of flour, and all the other uses of the plant are unimportant in comparison with this. Except when cut green the straw is of little value for hay. The mature stalks, however, are used in the manufacture of straw-plaited goods and in making paper. Starch and glucose are obtained from the grain, and it is also employed in the manufacture of some of the stronger alcoholic liquors.

Enemies.—There is no grain more liable to disease or that has a greater number of insect enemies than wheat, and the prevalence of the former or the frequent depredations of the latter have deterred many from raising this crop. There are some regions where wheat-growing is but rarely successful, on account of the presence of one or the other or both of these destructive elements. Particularly is this the case in the cotton-growing States, where the wheat-plant rarely escapes the attacks of disease, such as rust and smut. These two forms of disease, rust and smut, are those most feared by the farmer. The former is caused by, or rather is, a minute parasitic fungus known to botanists as *Puccinia graminis.* It appears in the spring upon the leaves of the barberry, and develops into a state known as barberry cluster-cups or barberry rust. Later in the season, and usually after the cluster-cups have entirely disappeared from the barberry, a second stage in the development of the fungus takes place, appearing upon the leaves and stems of wheat, oats, etc. as pale yellowish or whitish spots beneath the epidermis, which in a few days they break through, exposing long lines of orange-red spores. The rapid increase of the parasite at this stage often causes the death of the plant upon which it is growing. This condition of the disease (really of the fungus) is called red rust. Black rust, or what is commonly termed rust, is but another, the final, stage in the development of the same fungus. It forms the long black lines which show themselves upon the leaves, but more commonly upon the stems, and in ordinary cases upon the uncut part of the stem or stubble. Spring wheats are less liable to the attacks of this fungus than winter varieties, and heavy soils are less subject to it than light ones (*Balfour*).

Smut and bunt are terms applied to species of minute fungi which appear in the chaff or grain of the wheat and other cereals. The former is a species of ustilago (*U. carbo*), and shows itself by producing an abnormal or abortive growth in the heads of wheat and changing them into a black soot-like, powdery mass. The latter is a species of tilletia (*T. caries*), the spores of which are formed only in the young ovaries of the wheat or other grain. There is no external appearance of disease, as in rust and smut. The grain remains bright and plump, but when broken open the farinaceous matter is found to be replaced by a minute black dust of strong, unpleasant odor and greasy feel. Bunted grain may not show its character until it is ground into flour. Then, if in any quantity, the odor and color are apparent, and the produce is wholly unfit for human food.

The soaking of the seed in a dilute solution of sulphate of copper or of brine is practised by wheat-growers in order to prevent the development of smut and bunt. It is more difficult to prevent the attacks of rust. Thorough culture and the moderate application of lime on the growing crop late in the fall or early spring, when wet with dew or rain, and early harvesting while the grain is yet soft, will often check or greatly mitigate this evil.

Among the insects—and there are many—destructive to the wheat-plant are the Hessian fly (*Cecidomyia destructor*) and the wheat-midge (*C. tritici*). The former, as is well known, affects the wheat-stalks, imbibing the juices of the plant, and the latter attacks the chaff and grain. Another insect, the chinch-bug (*Rhyparochromus leucopterus*), and the army-worm (*Leucania unipuncta*), are also very destructive to the wheat-crop in seasons when they are abundant. (See CHINCH-BUG, and HESSIAN FLY.) (F. L. S.)

INDIAN CORN—MAIZE.

This plant belongs to the grass family, and the tribe *Phalarideæ.* Though of gigantic size and most striking appearance, its general structure is like all the grasses, except that the stem, instead of being hollow, has its centre filled with a light, pithy, fibrous structure. This stem is divided by nodes, and the outside covering is of a silicious nature, giving great solidity and strength. The leaves are long, linear, lanceolate, flat, with a prominent midrib, the whole structure so altered at its base as to make it a very strong, thick attaching sheath. The nodes are not at regular intervals along the stem, occurring more frequently near its base, and always from its first, and sometimes from its second and third, it sends out "brace" roots into the soil, which give material support to the luxuriant plant when swayed by the wind, and probably in the end perform the ordinary functions of the root. This habit of the plant can be modified by "hilling" the earth about it, but its strength and ability to sustain itself are not increased thereby. The length of the node-spaces varies in different varieties, but is in about the proportion of two, five, and ten inches from the base to the centre of the stem. Its inflorescence is monœcious. The staminate flowers are developed in the form of a cluster of branching pendent spikelets at the end of the stem, giving the whole plant a most beautiful and symmetrical appearance, and forming what is called the "tassel." It produces a great abundance of pollen in the form of granules, very fine, light, and dry, which is readily disengaged and borne long distances by the wind. The pistillate flowers are developed within the leaf-sheath at the nodes of the stem, and consist of a rachis called the "cob," the ova in large numbers disposed upon it in rows; a long, attenuated thread attached to each embryo, called the "silk;" the whole covered with a mass of imbricated leaves folded together quite closely at the tip, and called the "husks." From this the silk of all the embryos is usually exposed in a flowing cluster or bundle. In some cases of abnormal growth or artificial interference this silk is screened from the falling pollen, and results in an inferior cob, partially or totally bare of grain. This whole organ is called the "ear."

In the early stages of growth, or soon after the tassel appears, embryotic ears are found at the axils of all the leaves, but closely imbedded in the groove of the stem; but it is very rare, if ever, that all are developed, most being absorbed in the process of growth. In the most prolific fields many barren stalks can be found. It is not uncommon to see two or three matured, fairly-developed ears on a stalk, but an average of one in field-culture is as much as can be anticipated; and this will make the yield abundant.

The plant has a great root-development, though the precise form and extent vary with the kind of soil in which it grows. The great mass of the roots will be found in the warm soil near the surface, and if it is of poor quality will extend long distances, with few lateral branches, as if in search of food. In such a soil they have been found twenty feet in length, but if in their great extension they anywhere come in contact with a pocket of actual plant-food, the extension ceases and fibrous rootlets are developed. In a highly manured or rich soil these organs are comparatively short, and cluster in a mass of threadlike rootlets or root-hairs.

The form of the fully-developed ear and of the kernel varies much with different varieties, but all have a marked general resemblance. The ear is a tapering cylinder, but the less the taper, and the smaller the cob in proportion to grain, the better. Except in cases of a "sport," the grains are disposed on the cob in regular rows of from eight to twenty, but never of an odd number. They are flattened on the sides, wedge-shaped from the surface to the point of the hull, and in some varieties from one-half to three-fourths of an inch in length, by one-fourth to one-half inch breadth. One extensively-grown variety has its surface dented, as if punctured by the thumb-nail while in a plastic state, and is known as "dent" corn. Others have oval surfaces, and some of the smaller are tooth-like. The germ is at the point of attachment to the cob, well imbedded in the endosperm and covered with the hull.

The growing plant, if well fed, is dark green in color, but becomes light green or straw-colored if scantily nourished or approaching maturity. The ripened grain has in different varieties all the colors of the rainbow and all the shades of color which can be formed by a mixture of the same; but those which are solid and generally prevail are light yellow or white.

There is but one known species, but the varieties of maize are almost numberless. It is found perfectly developed and mature with stems from three to eighteen feet in height, and with ears from half an inch to three inches in diameter and from two to seventeen inches in length, and grains large or small in proportion. Owing to the peculiar sexual organization of the plant, the ease with which the pollen is carried long distances by the wind, and its susceptibility to modification and change in consequence of changing natural circumstances or the arts of the cultivator, new varieties are easily formed, and by careful selection, crossing, and breeding desirable qualities and characteristics are obtained with as much certainty as in the rearing and breeding of domestic animals. Dr. E. L. Sturtevant has by this method bred out undesirable qualities of cob, grain, and fruitfulness in a common variety, and secured opposite characteristics and a fixed type. Others have obtained similar results, but there is yet abundant room for effort in this direction. This habit and aptitude of the plant has its drawbacks; for a desirable variety, once secured, is liable to become mixed with any baser sort which flowers at the same time, and is contiguous or less than 100 rods distant. The actual result will depend much on the direction and force of the wind when the ripened pollen is disengaged from the tassel, but there is no assurance of safety from contamination within that distance.

History.—A diversity of opinion has been expressed in relation to the origin of Indian corn, but there is a decided weight of testimony that it is a native of tropical or semi-tropical America, though now it is nowhere found growing in its wild state. No records show that it was cultivated or known on the eastern continent prior to the discovery of America. But early voyagers and explorers found it here the staple crop, the only cereal grown by the aborigines, and produced and consumed by them in large quantities in all parts of the continent, from the latitude of 43° N. to 40° S. Its value as a food-grain, as well as the large amount which could be produced by a given area of land, was fully appreciated by the early settlers, who mention it as a plant new to them, but adopted it as their staple grain-crop. Their estimation of its great value led to its being carried to Southern Europe, and eventually to quite extensive cultivation on both shores of the Mediterranean Sea. Its cultivation has extended thence until it is a prized plant on all the eastern continents and their adjacent islands. But nowhere has its cultivation been so universally carried on, or on so great a scale, and its multitudinous uses so fully appreciated, as in the United States. Here the quantity grown is not only enough to supply all home wants and uses, but large quantities for exportation.

Statistics.—The importance of Indian corn in the United States is most clearly seen by comparing its average annual production, area, and value with those of all the cereals (corn, wheat, oats, rye, barley, and buckwheat). Taking the annual average of the years 1871–81, we have the following:

	Production, bushels.	Area of crop, acres.	Value, dollars.
Total cereals....	1,989,466,651	91,724,657	1,064,871,301
Indian corn......	1,242,087,735	47,758,746	534,824,375

From which we see that Indian corn was more than 62 per cent. of the total cereal crop, its area was over 52 per cent. of that devoted to cereals, and its value greater than that of all the other grains combined. Taking now the crop for 1880, we find it amounted to 1,717,434,543 bushels, grown on 62,317,842 acres, and valued at $679,714,499. The average yield per acre of the whole country was about 27½ bushels, and the value $0.39 per bushel. In 1881, though a larger number of acres was cultivated than ever before (64,262,025), the yield per acre was only 18·6 bushels, while the average for the previous ten years had been 27 bushels, and the price per bushel rose from 39·6 cents in 1880 to 63·6 cents, the highest price since 1874. The total production was 1,194,916,000 bushels, valued at $759,482,170. In 1880 the State of Iowa alone produced 260,192,840 bushels, while Illinois followed close with 240,452,896 bushels; but in 1881, Illinois stood first, with only 176,733,000 bushels, and Iowa second, with 173,289,000 bushels. These were the only States whose product in 1881 exceeded 100,000,000 bushels. The amount of Indian corn and corn meal exported during the decade ending with 1882 amounted to 6 per cent. of the production, and this has scarcely any effect on the prices in this country. The amount exported in the year ending June 1, 1881, was equivalent to 93,648,147 bushels, and the amount for 1881–82 was 44,340,683 bushels. This decrease was owing to the comparative failure of the crop, already mentioned.

Cultivation.—Though, by careful tillage and manuring, Indian corn can be successfully grown almost anywhere within the temperate zones, yet it germinates and thrives best in a warm, sandy-loam soil and a high average diurnal temperature. Cold water in the soil, or even hot days and cold nights, are not favorable to its luxuriant or rapid growth. It is a gross feeder, and requires a fertile soil, and, unlike some of the cereals, is improved when fed freely with concentrated chemical fertilizers or the best of farmyard manures, which in either case should be incorporated evenly with the surface soil. It needs thorough tillage, but not deep, from the ploughing of the land to the "laying by" of the crop, which should be when the tassel has made its appearance. The crop, from planting to maturity, has been produced in ninety days, but with average varieties and average seasons four months are required. In the Northern States, to avoid the late frosts of spring and the early ones of autumn, it should be planted from the 15th to the 25th of May, and harvested from the 15th to the 25th of of September. It will germinate most quickly and produce the most vigorous plants if planted at a depth of one and a half inches in a warm, moist soil, or when the season is so advanced as to give an average diurnal temperature of 60°. Diversity of practice prevails in relation to "thick-and-thin" planting; and necessarily so, owing to the requirements of the different varieties. The small early varieties of the Northern States are planted with rows three feet apart, and the hills two feet and a half in the row, with four plants in the hill; the medium varieties of the Middle States, four feet apart in hill and row, and four plants in the hill; the large Southern corn, with from four to five feet rows and hills, and with two plants in the hill. More grain is produced by planting in the drill with plants once in ten or twelve inches, but the extra tillage required costs more than the value of the extra corn produced. The price of corn is, and probably will continue to be, so low that the farmer cannot afford to cultivate it except with machinery adapted to horse-power and fields laid out for the purpose. Three methods of harvesting are practised: First, where the corn is grown for the grain alone or where the fodder has little value, as in some of the remote Western States, it is allowed to stand untouched in the field until the grain is mature and hard, when the ears are husked from the stalks, which are left to be trodden down by cattle and swine or ploughed into the soil; this method gives the best grain. Secondly, where the fodder has a money-value or a value for feeding stock at the barn, it is not uncommon to cut off the top stalks at the ear and secure them in good condition, and when the corn has become dry and hard it is husked from the "stub-stalks" which are left in the field. But the more general method is, when the grain is glazed on the surface and the fodder is changed from a dark to a light green, to cut the entire mass of the crop near the ground and set it in what are called "shocks" or "stooks," either as loose stalks or after it has been bound in bundles. The shock is erected in such an inclined position that it will shed rain, and not so large but that air will circulate through it. When the grain is so dry that it is safe to store it in bins and the fodder in the mow or stack, the ears are husked and the whole crop taken from the field. Taking the value of both corn and fodder into account, the last is the best method.

Food-Value and Uses.—Probably no other of our farm-crops is adapted to the supply of such a wide range of wants as Indian corn. In nutritive capacity it is very rich, comparing favorably with wheat and oats, as the following contrast will show: Corn contains of protein, or flesh-and-tissue-forming material, 10·6 per cent.; of fat, 6·5; nitrogenous free extract, 65·7; crude fibre, 28; ash, 1·7. Wheat contains of protein, 11·7 per cent.; fat, 1·6; nitrogenous free extract, 66·2; crude fibre, 3·0; ash, 1·7. Oats contain of protein, 12·0 per cent.; fat, 6·0; nitrogenous free extract, 56·6; crude fibre, 9·0; ash, 2·7. Analytical investigations show that the quality of corn can be materially changed and its nutritive capacity increased by manuring and cultivation, but the standard given above is the average of many specimens. For domestic uses, as a food-grain, it is served in an almost endless variety of forms, and is relished and used by the rich and the poor alike—by the former on account of its many excellent qualities, and by the latter for the same, and also on account of its great abundance and cheapness. The sweet varieties especially furnish a most toothsome dish when the ears are taken green, boiled, and the kernels eaten from the cob or cut off and served in milk. "Canned corn," used as a substitute for both of the above, is prepared for the general market, and finds a ready sale, not only in the United States, but in foreign countries. For this purpose the best sweet evergreen varieties are used. The ears are picked when in full growth or in the milk, and the kernels cut from the cob and boiled soft, or boiled on the cob and cut afterwards, which makes the best article. It is then sealed in air-tight tin cans, and may be kept for years without losing its qualities. No inconsiderable quantity is annually prepared for market by cooking and taking it from the cob, and then drying it in large kiln-drying rooms on revolving machines heated for the purpose. In 1880 one establishment in the State of Maryland canned the corn from 2500 acres, putting up as many as 75,000 cans per day during the canning-season. There are many similar establishments in the Middle and Northern States. The value of the corn canned in the State of Maine in that year was $1,500,000, which was but a small part of the year's product of the country.

"Hulled corn," a much-relished dish, is prepared by taking shelled corn of superior quality, and boiling it in a weak lye made from wood-ashes or the carbonate of potash until the hull or cuticle covering the grain is loosened. This is then rubbed off with the hands, care being taken not to break the form of the kernel, and the grain washed to remove the lye and all taste of it, after which it is boiled until soft, and served in milk, or eaten as a substitute for bread or vegetables. This dish is generally prepared by the farmer's family, and only for home consumption, but is sometimes found in provision-stores or sold from house to house in villages. The grain is often simply cracked or ground coarse, and after the chaff is removed by washing it is boiled soft and made edible. This is called "samp" in New England and "hominy" in the South. The white corn of the latter section has a considerable market sale as hominy after being ground in this way and the hulls removed by sifting.

The famous "boiled Indian pudding," "baked Indian pudding," "hasty pudding," all made of corn meal, and the "Indian" and "rye-and-Indian bread," are still as palatable, healthful, and nutritious as of old, and on account of their real value and small cost are worthy a prominent place in the cuisine of every family.

The carbohydrate content of maize is largely starch, and this substance is manufactured from it in such quantities as to be a commercial product of considerable importance. It is sold simply as starch and used for stiffening cloth, or in a somewhat refined form and by different names for use in making cakes, custards, and puddings. By treatment with acid, starch is changed to glucose or grape-sugar. This fact, as well as its abundance in the grain, cheapness, and ease of manufacture, has led to the development of an industry of great magnitude.

In the domestic economy of the farm throughout the country Indian corn holds the first place as a grain. It is freely fed to all kinds of stock in the ear, shelled, and shelled and ground. The former methods are wasteful, and as far as possible the latter form is adopted. Its richness in oil adapts the grain to the fattening of cattle and swine, and in these industries it is indispensable. For the stock of the butter-dairy no other grain gives a product of such perfect quality. Nine varieties of corn were examined at the Massachusetts Agricultural College to ascertain the comparative air-dried weight of corn and cob and the nutritive content of the latter. The maximum weight of cob was 21 per cent., the minimum 12 per cent., and the average 16 per cent. The analysis of the cobs shows that they possess no inconsiderable nutritive value, and when ground with the grain, as is quite often done, they increase the sum-total of nutrition obtained from the crop, and by distributing the concentrated nutrition of the grain produce beneficial results in the animal economy. The cob contains—of fat, 0·35 per cent.; of protein, 3·14; non-nitrogenous matters, 56; crude fibre, 30; ash, 0·68. This analysis compares favorably with the straw of our grains, and in fact with all our coarser hay-fodders, and if as digestible the cob is equally valuable after being ground.

The stalks are valuable as stock-feed, and are utilized in several forms. First, as "fodder corn." This is the crop produced by sowing the seed in June in the Northern States, but earlier at the South, in drills or broadcast, and harvesting it as soon as the ears are developed by cutting and drying it. To produce this crop the land should be thoroughly tilled and manured, and from three pecks to a bushel of seed to the acre planted in drills, which should be three and a half or four feet apart. A yield of four tons of dry fodder to the acre is a good crop. Secondly, "corn-fodder." This is the stalks, husks, and leaves which remain after the ears have been harvested, and, though only incidental to corn-growing, greatly increases the value of the whole crop, and adds largely to the ability of the farmer to sustain the farm-stock. The average yield of this fodder per acre is about two tons, or nearly double the average yield of hay. Its nutritive value, as compared with the best of clover hay, is as follows: Water free, it contains—of protein, 7·5 per cent.; fat, 1·8; nitrogenous free extract, 54·4; crude fibre, 31·5; ash, 4·8. Clover hay contains—of protein, 14·3 per cent.; fat, 2·9; nitrogenous free extract, 46·3; crude fibre, 30·5; ash, 6·3. Thirdly, in the form of ensilage. This is the stalks and leaves harvested in a green and growing state, cut very fine by machinery, and preserved from decomposition by exclusion from the air in pits in the ground or in air-tight compartments on the surface called "silos." This method of utilizing corn-fodder is comparatively new in America. It is claimed for it that all danger of loss and injury from storms and bad weather, which may occur when it is being sun-dried or from heat and mould in the ordinary mow, is avoided, and that in this succulent state it is better stock-feed than when dry. These claims appear reasonable, but the sum-total of nutrition contained in the crop is not increased thereby, and it will not sustain a given stock any longer than the same quantity dried.

It has long been known that the cornstalk, especially of the sweet-corn varieties, is rich in saccharine matter, and many attempts have been made in the past by imperfect methods to obtain its juice and make therefrom syrups and sugar suitable for domestic use. These repeated efforts, though not attended with perfect success, led the United States commissioner of agriculture to institute a series of scientific examinations to determine its practicability. The first examinations were made in 1879, when stalks were analyzed at different stages of growth, and after the corn had ripened and the ears were taken off. A very good syrup was made and some sugar extracted, which led to the belief that it was possible to harvest a large crop of grain and then express the juice remaining in the stalk, and from it make sugar at the rate of 1000 pounds per acre. In 1880 the work was continued, and eleven varieties were examined at different stages of growth between the 24th of July and the 23d day of October. As a whole, they were found to contain the most sugar when in maturity in the latter month. The maximum per cent. found in the juice of any sample was 14·65, the minimum, 4·56, and the average, 10·22, or about one-half as much as in the average sugar-cane of Louisiana. So far as the actual manufacture of sugar was concerned, the experiment was not a success, but it indicates quite clearly that the plant has marked qualities in this direction which under some circumstances may be made a profitable adjunct to the production of the grain. (See SUGAR FROM CORNSTALKS, p. 126.) (L. S.)

BARLEY.

Barley (*Hordeum*) is perhaps more extensively used than any other grain. The traditions of the ancients make barley the first grain-food of man. It is certain that it has been used for food both for man and beast from very early times. Frequent mention is made of it in the oldest records of the Egyptians and Romans and in the sacred writings of the Jews. It is adapted to both hot and cold climates. It was cultivated by the Jamestown colony in 1611, and in 1629 by the colonists on Massachusetts Bay. Since 1850 the increase in the production of this cereal in the United States is greater than that of any other grain. In that year 5,167,015 bushels were raised; in 1860 the yield was 15,825,898 bushels; the crop of 1870 was 29,761,305 bushels; while the total yield for 1880 was 44,113,495 bushels—nearly eight times the amount raised in 1850. As barley is used almost as exclusively in this country for the manufacture of beer as wheat is for the production of flour, the increase in cultivation of this grain is significant.

The greatest increase in the production of this grain, like that of wheat, appears in the Western States and California. New York State produces 7,792,062 bushels, which exceeds the combined amount raised in all the States east of the Mississippi. California, New York, Wisconsin, and Iowa produce more than two-thirds of the entire barley-crop of the country. The States producing 1,000,000 bushels or over are—

California	12,579,561	bushels.	Nebraska	1,744,686	bushels.
New York.	7,792,062	"	Ohio	1,707,129	"
Wisconsin.	5,043,118	"	Illinois	1,229,523	"
Iowa	4,022,588	"	Michigan	1,204,316	"
Minnesota.	2,972,965	"			

The annual average production of barley in the United States for the ten years included between 1870 and 1880 was 33,704,652 bushels, and for the same period the average yield per acre was 21·9 bushels, and the average price per bushel 74·7 cents, making the average value per acre $16.35+, which is higher than that of any other cereal. According to the report of the Department of Agriculture, the greatest average yield per acre is found in Vermont and California, both having the same, 28·3 bushels; but in the former State the price was 75 cents, while in the latter it was only 61 cents, per bushel. The soil and climate of California seem remarkably favorable to the production of this grain, and nowhere is it grown with less cost or trouble. A single seeding suffices for the production of three or four successive crops, so that the only work after the first sowing is the harvesting, which is done in the same wholesale way as with wheat.

There is a small export of barley from the United States, amounting in 1880 (for the year ending June 30) to 1,128,923 bushels. The export for the following year was considerably less, being only 885,246 bushels, but there was an increase in the exports of beer, ale, and porter. In 1880 the number of dozen bottles of these liquors exported was 146,739, and the number of gallons in casks was 111,308. In 1881 the number of dozen bottles was 164,276, and of gallons was 201,376—an increase of 17,537 of the former and 90,068 of the latter.

The following table will serve to give an idea of the extent of the culture of barley in European countries; only those raising over 10,000,000 bushels are included:

Country.	Year.	Crop for year specified, bushels.
Austria	1871	46,234,017
Bavaria	1873	17,501,814
France	1873	53,163,763
Great Britain	1873	91,513,013
Italy	......	13,321,218
Prussia	1867	86,742,609
Russia	1870	124,255,047
Spain	1857	58,471,962
Sweden	1872	12,574,379
Turkey	1868	25,542,000

In the northern countries of Europe the production of barley greatly exceeds that of wheat, and in these countries it is very largely used in making bread, wheat or "white bread" being limited in its use to the upper classes. In Sweden there is nearly six times as much barley raised as there is of wheat, while in Finland there are more than seventy times as many bushels of barley raised as there are of wheat. As just stated, the barley-crop of these countries represents very largely the bread-supply of the people, but in America barley bread is almost unknown, the use of the grain being confined to the making of beer, ale, or porter or to the feeding of domestic animals. For the latter purpose it is often mixed with some other grain, as with oats when fed to horses. Barley meal and whole barley that has been swelled by soaking are given to cattle, and especially to swine in those sections where corn does not succeed well. Not only is the grain valuable for feeding stock, but fall-sown barley makes excellent autumn feed, and in the warmer States affords a fine pasturage through the entire winter. This use appears not to affect its productive capacity, as it quickly recovers itself when relieved of the stock in the spring.

Barley possess diuretic properties, and both the grain and the straw are used in medicine.

The cultivation of barley differs but little from that of wheat. It is quite as exacting in its choice of soil, demands a greater supply of similar mineral food-elements, and is equally ready to give increased returns for good culture. By special treatment a yield of 60 to 70 bushels to the acre has been obtained. The advantage which the system of drilling possesses over that of sowing the grain broadcast is the same with barley as with wheat, and the drill is now very generally used in the cultivation of this crop. Although quite as particular in regard to soil and culture as wheat, barley will stand a much greater range of temperature. It is productive as far north as the 70th parallel in Lapland, while within the tropics it is successfully raised on lands but slightly elevated above the sea. It comes more quickly to maturity than any other grain, and, unlike corn, is equally rapid in its development in the south as in the north. According to Linnæus, six weeks from seed-time to harvest is the rate of growth in Lapland In the United States, spring barley, sown in May, is ready for harvest in the latter part of July; winter barley, almost the only variety sown except in the higher latitudes, matures much earlier. Very little barley is grown at the South, its production being chiefly confined to the northern sections. Large quantities are imported by brewers from Canada. Canadian barley being regarded as especially fine in quality for the manufacture of beer, ale, etc. California supplies the Eastern breweries with large quantities of choice grain. About $1\frac{3}{20}$ bushels of grain are required to make 1 bushel of malt, and 2 bushels of malt are sufficient to make 1 barrel of ale.

Barley, like wheat, is divided into spring or summer and winter varieties. It is also divided, according to the number of rows in the ear, into two-, four-, and six-rowed barley. The six-rowed Canadian barley is a winter variety, and is very generally cultivated throughout the country where winter barley is sown. Mensury is a summer barley, and is much grown in the Northern and North-western States. Nepaul, a beardless variety, has obtained much favor in some sections; Chevalier is a variety largely cultivated in California, and is in great demand in the Eastern markets.

From 2 to 3 bushels of seed per acre are usually sown, the quantity required varying with the nature of the soil, manner of sowing—whether broadcast or drilled—and the kind cultivated.

Although barley is less subject to the attacks of insects and disease than other grains, greater attention to the exact time of harvesting and manner of curing is required to prevent a partial or even total loss of the crop. The long beard and abundant husks attract and hold quantities of moisture, so that a moderate spell of wet weather near the time of maturity may destroy the value of the grain by causing it to sprout in the ear. Barley must be allowed to ripen before harvesting, but it must not be left standing after this period. When the heads hang down, and the longitudinal red streaks on the grain have disappeared, and the straw assumes a golden hue, the season for cutting has arrived. This grain will not stand the severe methods of thrashing applied to wheat, for the embryos of the kernels are easily broken off, destroying their value both for brewing purposes and for seed; the thrasher must run lighter and with fewer spikes than for wheat. (F. L. S.)

OATS.

Oat (*Avena sativa*), an annual plant of the order *Gramineæ*. Its cultivation antedates historic records, but is more recent than that of wheat or barley. Pliny mentions its use as a diet for the sick. Oatmeal, prepared in various ways, is largely used for food by the people of Scotland and by the peasantry of Northern Europe. In the form of oatmeal pudding or porridge it is eaten by all classes in America, and is a favorite dish with invalids or those with impaired digestion. The most general use of oats is to supply grain-food for horses, and for this purpose they are often mixed with cracked corn, and sometimes with barley. They are rarely fed to other kinds of stock, although they are said to make excellent food for swine.

Oats have been cultivated in North America since its earliest settlement by Europeans. They were sown with other grains by Gosnold on the Elizabeth Islands in 1602; in 1629 they were introduced by the colonists on Massachusetts Bay; and now there is not a State in the Union that raises less than 150,000 bushels annually. The total production in the United States is next to that of wheat in amount and value, and greatly exceeds that crop in both these particulars in many of the Northern States, especially in New England. The following table shows the comparative quantities of wheat and oats raised in each of the New England States in 1880:

	Wheat, bushels.	Oats, bushels.
Maine	665,714	2,265,575
New Hampshire	169,316	1,017,620
Vermont	337,257	3,742,282
Massachusetts	15,768	645,159
Rhode Island	240	159,339
Connecticut	38,742	1,009,706
	1,227,037	8,839,681

Illinois, leading the States of the Union in its corn- and wheat-crops, also stands at the head in the production of oats. The States producing more than 10,000,000 bushels are named below: Illinois, 63,189,200; Iowa, 50,610,591; New York, 37,575.506; Pennsylvania, 33,841,439; Wisconsin, 32,905,320; Ohio, 28,664.505; Minnesota, 23,382,158; Missouri, 20,670,958; Michigan, 18,190,793; and Indiana, 15,599.518. The total production in the United States was 417,885,380 bushels, and in 1881 it was 416,481,000 bushels. In 1850 the number of bushels raised was 146,584,179; in 1860 it was 172,643,185; and in 1870 it had increased to 282,107,157 bushels. The average yield per acre throughout the country in 1880 was 25·8+ bushels, and the average price per bushel was 36 cents. In New England the price ranged from 45 to 53 cents, in Nebraska 26 cents, while in Florida it was 95 cents. But little success has attended the cultivation of oats in the Southern States, owing to the attacks of rust. In some Northern States the average yield is as high as 30 bushels to the acre, while in Florida and Alabama it is less than 10 bushels. The quantity of grain exported is small in proportion to that raised. In 1879 the foreign shipments amounted to 5,452,136 bushels.

Nearly all the countries of Europe cultivate this cereal, and the united yield of France, Great Britain, Russia, and Prussia exceeds 1,000,000,000 bushels. Russia alone produced, in 1870, 590,746,010 bushels.

There are many varieties of oats, some of which have been widely cultivated. Oats are divided into three classes—white, yellow, and black. They are also divided into spring and winter varieties, but in this case there is no material difference in the oats themselves. Winter varieties prevail at the South, while in the North only spring varieties are sown. The following are among the varieties best known to the American farmer: The "potato oat" and the "New

Brunswick" from Scotland; the "Scottish dun," a winter variety; the white and black "Swedish;" "white Schonen;" "Hopetoun oat;" white and black "Tartarian;" "yellow Lothian;" "Norway oat;" and "Excelsior oat." This last was imported from England in 1868, and has proved an excellent variety. It is early, gives a large yield, and succeeds well under great diversities of soil and climate. It is stated that from 4 quarts of Excelsior oats sown 7½ bushels were harvested, weighing 37½ pounds per bushel.

Oats yield fairly on soils where other grains prove a total failure. If the land be ploughed at the right season, and the seed be properly sown and covered, there is scarcely any variety of land that will not produce a fair crop. Like other cereals, oats respond promptly to good culture. The yield may often be doubled by the use of fertilizers, but, more than other grains, oats are liable to "lodge" when the land is made too rich.

Clean seed should be used, and the variety should be that which is known to succeed well in the given locality. At the South fall sowing is generally practised, but in the Middle and Northern States it is the custom to sow in the spring, as soon as the soil is in condition to till. Late sowing is sometimes practised when it is intended to forage the crop or plough it under. The manner of sowing is generally broadcast. The amount of seed per acre is from 2 to 5 bushels. Southern planters use less seed than those at the North, and the quantity also varies with the quality of the land. Experiments prove that about 3 bushels to the acre will give as large a yield as though more seed were used. In the higher latitudes oats will come to maturity in less than ninety days, while in more southern districts more time is required.

If desired for seed, oats should be allowed to ripen fully before harvesting, but when the object is to feed them out on the stalk, they may be cut as soon as the stems begin to turn yellow just below the panicle, and while the foliage is yet green. At this time they are regarded but little inferior to the best English hay. The grain is sometimes cut with the scythe, but the mowing-machine, the reaper, or the cradle is commonly used.

The legal weight per bushel for oats in most of the States in the Union is 32 pounds. In Nebraska it is 34 pounds, and in Maine, New Jersey, and Pennsylvania it is 30 pounds. The actual weight per measured bushel varies exceedingly. Upon rich lands and those especially suited to the growth of the plant the grain will often exceed 45 pounds to the bushel, while upon inferior and sandy soil the weight falls as low as 25 pounds. There is a very marked difference in the composition between "light" and "heavy" oats. Herepath (*Journ. Roy. Ag. Soc.*, xi. p. 107) has published analyses of light oats from sandy soil, the yield being 6 bushels per acre, and heavy oats, from the same soil after "warping," where the produce was 64 bushels per acre. Some of his results, per cent., are as follows:

	Light oats.	Heavy oats.
Potash	9·8	13·1
Soda	4·6	7·2
Lime	6·8	4·2
Phosphoric acid	9·7	17·6
Silica	56·5	45·6

The following table illustrates the composition of the ash of the oat-plant and of its parts:

Part analyzed.	Percentage of ash.	Potash.	Soda.	Magnesia.	Lime.	Phosphoric acid.	Sulphuric acid.	Silica.	Chlorine.
Oats heading out	9·46	41·7	4·4	3·5	7·0	8·3	3·4	27·9	4·4
Oats in flower	7·23	39·0	3·3	3·2	6·7	8·3	2·7	33·2	4·0
Oat straw	5·12	22·0	5·3	4·0	8·2	4·2	3·5	18·7	
Oat chaff	9·22	13·1	4·8	2·6	8·9	0·3	2·5	59·9	
The grain	3·07	15·9	3·8	7·3	3·8	20·7	1·6	46·4	

The appended table gives the proximate composition of the products named:

Part analyzed.	Water.	Organic matter.	Ash.	Albuminoids.	Carbohydrates, etc.	Crude fibre.	Fats, etc.
Oat straw	14·3	80·7	5·0	2·5	38·2	40·0	2·0
Oat chaff	14·3	67·7	18·0	4·0	29·7	34·0	1·5
Oat early blossom.	81·0	17·6	1·4	2·3	8·8	6·5	0·5
The grain	14·3	82·7	3·0	12·0	60·9	10·3	6·0

Detailed Analyses of Oats.

Analyst.	Albuminoids.	Starch.	Gum and sugar.	Fat.	Bran and crude fibre.	Ash.	Water.
A. Müller	8·8	55·4	2·5	6·4	9·6	2·7	14·6
Anderson	10·2	...	...	6·1	10·0	2·7	12·4

(F. L. S.)

RYE.

Rye (*Secale cereale*) has been cultivated for many centuries, but it is probably of more recent origin than either wheat or barley. It is thought by good authorities that the word translated "rye" in the Bible refers to a variety of wheat. The earliest English settlers brought rye to America, and it has always formed an important part of the cereal productions of this country. It is less generally cultivated than the other grains, however, and it is now much less used for food than formerly. Its cultivation extends northward to the fifty-second parallel on the eastern half of the continent, while upon the west coast it extends to lat. 57°. The United States in 1880 produced 24,540,829 bushels of rye. Pennsylvania raised 5,857,425 bushels; New York, 3,611,471; Illinois, 3,049,860; Wisconsin, 2,329,470; Iowa, 1,379,932; and New Jersey, 1,297,362. It will be seen that these six States produced more than two-thirds of the entire crop of the country for that year. The annual average yield for the last decade was 18,460,985 bushels. Unlike the other grains, there has been little or no increase in the production of rye in this country for many years. The crop for 1840 amounted to more than the annual average yield just quoted, while the yield for 1870 was only 16,918,793 bushels. The average produce per acre is between 15 and 14 bushels, and the usual price is from 75 cents to $1. Although rye is cultivated to some extent in all the Southern States, the product in grain is small, being as low as 5 bushels to the acre in South Carolina. The average yield per acre is highest in Oregon and Vermont, being 18 bushels in the latter and 20 in the former. In Maine the legal weight of a bushel of rye is 50 pounds; in California, 52 pounds; in all the other States it is 56 pounds. In spite of the comparatively small amount raised, there is a moderate surplus for exportation. The rye export for 1880 was, in grain, 2,912,754 bushels, and in flour, 5190 barrels. More than half the quantity exported was sent to Belgium and the Netherlands. Rye enters more largely into the grain-crops of Europe than of America, and there also it is more largely used for food. The following are the countries of Europe whose rye-crop exceeds that of the United States:

Russia	616,954,569	bushels.
Prussia	173,485,733	"
France	58,971,844	"
Spain	25,511,775	"
Bavaria	24,550,565	"

The small country of Belgium produces over 13,000,000 bushels, and the crop of Sweden exceeds 15,000,000.

Rye is more fixed or permanent in its characters than the other cereals, and is less subject to variations by changes in climate or soil. The winter and spring varieties differ rather in habit than in physical nature.

Although benefited by the application of phosphates, rye requires less culture than other grains, and seems to thrive best on the light gravelly or sandy soils of the Eastern States; rich and heavy lands are unsuited to its growth. The manner of sowing and harvesting is the same as for wheat. More care is exercised in the handling of the straw, however, as this part of the plant is quite as valuable as the grain-product. Land which is wholly unfit for other grains may be selected for rye, and a Connecticut farmer estimates the cost per acre of raising a crop as follows: Ploughing, \$2; harrowing twice and sowing, \$2: harvesting with horse-reaper, \$1; threshing, \$2—total, \$7. This does not include taxes or land-rent, but he considers that the total cost of production is covered by the value of the grain, leaving the value of the straw as the profit. The price of the straw is variable, but is usually about the same as that paid for good hay. Rye straw is little valued for fodder, however, but in the early stages of its growth it is esteemed as a forage-plant, and is sometimes sown for this purpose alone in the Southern States, cattle being allowed to graze it during the fall and winter months. The land should be ploughed in August or early in September, and the grain sown some time during the latter month. Where the climate will permit the seed may be sown during any of the winter months. When sown in the spring it should be done as early as possible.

Besides its use for food, rye has long been used in the manufacture of liquors, more especially whiskey. The straw is employed in the making of a great variety of articles, such as paper, hats, bonnets, mats, slippers, numerous toys, and fancy articles.

The following analyses of the different parts of the rye-plant are taken from Johnson's *How Crops Grow:*

Substance.	Water.	Organic matter.	Ash.	Albuminoids.	Carbohydrates, etc.	Crude fibre.	Fat, etc.
Winter rye straw...	14·3	82·5	3·2	1·5	27·0	54·0	1·3
" " grain...	14·3	83·7	2·0	11·10	69·2	3·5	2·0
Rye bran...............	12·5	83·0	4·5	14·5	53·5	15·0	3·5

The following detailed analysis of rye, as given by different analysts, is quoted from the same work:

Where grown.	Albuminoids.	Starch.	Gum and sugar.	Fat.	Bran and crude fibre.	Ash.	Water.	Analyst.
Hesse....	13·6	50·5	8·9	0·9	10·1	1·8	15·0	Fresenius.
France..	11·6	56·5	10·2	1·9	3·5	2·2	14·1	Payen.
Saxony.	9·1	64·9	0·4	2·3	3·5	1·4	18·3	A. Müller.
"	9·6	56·7	6·4	2·1	8·5	3·3	16·5	Wolff.

Rye is remarkably free from the attacks of insects and disease. There is, however, a species of fungus (*Claviceps purpurea*) which attacks and destroys the grain, producing what is known as horned rye or ergot. This fungus is dangerously poisonous to both man and animals. The contact of one infected head of rye with an uninfected one is sufficient to communicate the fungus to the latter. This disease, as it is termed, is more likely to appear after a wet spring followed by a hot summer. As soon as observed the heads affected should be destroyed, and when the fungus is at all prevalent the destruction should be general. (F. L. S.)

BUCKWHEAT.

Buckwheat (*Fagopyrum esculentum*) is a plant of the botanical order *Polygonaceæ*, to which also belong smartweed (*Polygonum*), sorrel, and dock (*Rumex*), as well as rhubarb (*Rheum*). The large amount of farinaceous matter contained in the seeds makes them valuable as "bread-corn," and hence this plant, though not graminaceous, has been classed with the cereals.

Central Asia is supposed to be the native country of buckwheat. Some suppose it to have been carried to Europe in the early part of the twelfth century; others believe it to have been introduced into Spain by the Moors at a much earlier period. The Dutch in New York and the Swedes on the Delaware were the earliest cultivators of this grain on this side of the Atlantic. Samples of American growth were sent to Holland by the colonists of Manhattan Island as early as 1626. Kalm, the Swedish naturalist, who visited this country in 1748, speaks of its growing in New Jersey, Pennsylvania, and New York, but even at a much later period it had not entered into general cultivation. Statistics show that in 1790 over 14,000 bushels of this grain were exported, together with over 400 barrels of buckwheat flour.

According to the census reports, the total yield of buckwheat in the United States was—8,956,913 bushels in 1850; 17,571,818 in 1860; 9,821,721 in 1870; and 14,617,535 in 1880. From 1871 to 1881, inclusive, the annual average yield was 10,157,723 bushels, with an annual average value of \$7,172,081; the average yield per acre for the same period was 16·1 bushels, and the average price per bushel 70·6 cents.

The following table shows the distribution of this crop in this country. The quantity raised in the States south of Virginia is too small to be reported, while the combined crop of New York and Pennsylvania amounts to nearly two-thirds the entire yield of the country. The average annual value of the buckwheat crop is much less than that of any other cereal, being but little more than one-half that of the rye-crop, which stands next in value.

States.	Crop of 1880, bushels.	States.	Crop of 1880, bushels.
California.........	17,680	Nebraska..........	27,160
Connecticut......	162,313	New Hampshire	102,156
Illinois............	259,840	New Jersey......	562,240
Indiana............	106,110	New York........	5,135,652
Iowa................	238,143	Ohio................	380,311
Kansas.............	41,747	Pennsylvania....	4,109,291
Maine..............	480,000	Tennessee.........	75,440
Maryland.........	190,530	Vermont..........	348,400
Massachusetts...	104,240	Virginia...........	306,577
Michigan..........	624,160	West Virginia...	524,388
Minnesota........	66,130	Wisconsin.........	584,309
Missouri...........	83,742		

The area in the United States under buckwheat in 1880 was 822,802 acres, the average yield per acre 17·7 bushels, and the average price 59·4 cents. In New England the general yield is larger than in any other section of the country, the average for Maine standing as high as 25 bushels to the acre; while the value per bushel is only 50 cents, which is lower than in any other State where the plant is grown to any extent. The average price per bushel in Kansas (1880) was 94 cents, while in California it was 98 cents. Compared with other cereal crops, buckwheat stands seventh and lowest in point of money-value when the whole country is considered, but in Maine (in 1880) the value of the buckwheat-crop was \$240,000, while that of the barley-crop was \$188,635, and that of rye only \$37,807. In New York State the values of the rye and buckwheat crops were nearly the same.

Varieties.—There are several varieties of buckwheat, each commended for some special merit, such as adaptability to particular soils or climate, early maturing, large yield, freedom from the attacks of disease, etc. The special names of these varieties refer to the appearance of the hull or covering of the grain; as, the "rough," the "smooth," the "Scotch gray," and the "silver hull." The "Scotch gray" has long been a popular variety in some localities, but the "silver gray," a variety imported from Germany by the U. S. Department of Agriculture in 1865, has now the general preference; all others are classed by the seed-merchants as "ordinary." In parts of Canada and Maine the *Fagopyrum Tartaricum*, or Tartar buckwheat, is extensively grown. This species is prized for its hardiness and fruitfulness, but the quality is not considered the best. Still other species are cultivated in various Asiatic countries.

Cultivation.—The climate of the New England and Middle States seems especially suited to the growth of this crop; but, being very sensitive to the extremes of heat and moisture, its culture is not attended with the same success at the South. Under favorable circumstances, however, in the milder regions, three crops a year may be taken from the same field. It grows best on thin soil, especially if there be an admixture of clay; on rich land it grows rank and is liable to lodge. Buckwheat is often sown on recently-cleared land, where it generally does well. It grows even more rapidly than the weeds, which are kept down by the shade of its abundant foliage. In the United States the time for sowing the seed is the latter part of June or early in July. The crop is ready for harvesting in from sixty to ninety days after sowing. On account of the rapidity with which buckwheat comes to maturity, it can be sown upon ground from which a crop of winter wheat or barley has just been taken, or upon freshly-turned sod from which a crop of hay has been cut. It is a practice in some sections of the Middle States to sow buckwheat between the rows of corn just before the time for harvesting that crop. The seed is always cast by hand, and a bushel of it is sufficient for an acre of land. The yield per acre under especially favorable conditions has been as high as 50 bushels.

The farmer's judgment must decide the proper season for cutting, for the plants will continue to put forth blooms and to perfect seeds until checked by frosts. The general method of harvesting is with a cradle, setting the cut stalks up in small bunches to dry. The very tender hulls will not permit this grain to be thrashed by machinery. It is either trodden out by cattle or lightly beaten with a flail.

The legal weight of a bushel of buckwheat varies in the different States—from 40 to 55 pounds.

The following table shows the composition of the air-dry products of the cereals named. Buckwheat straw has a larger amount of ash in its composition than that of the other grains, while in the seed the quantity of ash is very much less. The excessive amount of potash in the straw is most noticeable:

Substance.	Water.	Ash.	Potash.	Soda.	Magnesia.	Lime.	Phosphoric acid.	Sulphuric acid.	Silica.	Chlorine.	Sulphur.
Barley straw	140	43·9	9·3	2·0	1·1	3·3	1·9	1·6	23·6	....	1·3
Oat straw	141	44·0	9·7	2·3	1·8	3·6	1·8	1·5	21·2	....	1·7
Buckwheat straw	160	51·7	24·1	1·1	1·9	9·5	6·1	2·7	2·8	4·0	
Wheat (grain)	143	17·7	5·5	0·6	2·2	0·6	8·2	0·4	0·3	....	1·5
Barley (grain)	145	21·8	4·8	0·6	1·8	0·5	7·2	0·5	5·9	....	1·4
Oats	140	26·4	4·2	1·0	1·8	1·0	5·5	0·4	12·3	....	1·7
Buckwheat (grain)	141	9·2	2·1	0·6	1·2	0·3	4·4	0·2	......	0·2	

The comparative nutritive value of wheat, barley, corn, and buckwheat is expressed in the following analyses by Wolff and Knop:

Substance.	Water.	Organic matter.	Ash.	Albuminoids.	Carbohydrates, etc.	Crude fibre.	Fat. etc.
Wheat	14·4	83·6	2·0	13·0	67·6	3·0	1·5
Barley	14·3	83·4	2·3	9·0	65·9	8·5	2·5
Maize	14·4	83·5	2·1	10·0	68·0	5·5	7·0
Buckwheat	14·0	83·6	2·4	9·0	59·6	15·0	2·5

Uses.—Buckwheat flour is rarely used in making bread, but buckwheat batter-cakes are favorite articles of food. The whole grain is a valuable food for domestic fowls. Buckwheat when cracked and mixed with other grains is fed to horses and to swine. The flowers of this plant afford large quantities of honey. The use of the buckwheat-plant as a green manure is still more important. A French writer has said: "We cannot too much recommend the employment of this precious plant as a manure." A small quantity of seed, costing very little, sows a large surface and gives a great bulk of leaves and stalks. It is the custom, when the plant is in flower, to roll it flat to the ground, and then to plough it in. Its shade while growing destroys all weeds, and the plant when buried is soon converted into vegetable mould. Used in this way, it not only decomposes rapidly, and so forms a good manure, but it also loosens the soil, and thus renders it permeable to heat, light, and moisture. When desirable it can be sown early, and two crops can be made available for enriching the land in one season, or the second crop may be allowed to produce seed. (F. L. S.)

2. Root-Crops.

Potato, Sweet Potato, Beet, Sugar-Beet, Mangel-Wurzel, Turnip, etc.

The term *Root-crops* is generally used to denote those varieties of farm-crops which grow partly or entirely within the soil. Some of them are not properly roots; their structure and mode of development are different, and they do not perform the ordinary functions of roots. They are either tubers—*i. e.*, underground stems with the roots and buds of stems—or bulbs, and are grown as important articles of food for mankind and the domestic animals. They are nearly all biennials; starting from seed, the vital force is expended the first year in storing a large quantity of starch, sugar, and earthy matter in their cell-structures, which in the second year again enters into the circulation to develop the flower-stalk and the seed. The different species of plants included in the designation are not equally valuable, or grown and used to the same extent; some of them are used exclusively as human food, others as stock-feed alone, and others indiscriminately, being equally valuable for both purposes. All are of sufficient importance to merit an account of their origin, history, composition, and qualities, and a description of the best methods of their cultivation.

Potatoes.—The most important of the roots, because the most universally grown and depended on as an article of human food, is undoubtedly the potato. This plant is a perennial herb, *Solanum tuberosum*, one of a large family, some of which do not develop edible tubers in the soil. Naturalists are unanimous in assigning the nativity of the potato-plant to the mountain-region of Western South America, where it can now be easily found in its wild state. Careful examinations of it have been made, and it is believed that two or three distinct species may be found there, but as yet the fact has not been established. The aboriginal inhabitants of Western South America cultivated and used it as an edible before the country was discovered by Europeans, but no mention is made of it by early historians or botanists as a plant known to the Indians of North America. It was one of the earliest soil-products carried from the new country to Spain, and thence to Italy, but the exact date of its introduction into the Old World is unknown. Sir Walter Raleigh carried it to England in 1586, and thence it was distributed over Germany and other countries along the North and Baltic Seas. Though considered a desirable addition to the list of European crops, yet it was slow of adoption as a farm-crop and as a staple article of vegetable food; and its value was not fully recognized either there or on this side of the Atlantic until late in the last century. Though it is deficient in some important elements of nutrition, yet there is perhaps no crop grown that will produce so much and so palatable human food from a given land-area as this; it is therefore an invaluable boon to densely-populated countries. In such, its general introduction has averted famine, and the failure of the crop for a single year has been a national calamity, causing widespread suffering. So great is the reliance of the Irish people on this crop, which seems to be peculiarly adapted to their soil and climate, and so generally has it become their staple article of food, that by common consent it is called the Irish potato.

Grown on different soils and under differing circumstances of climate and manuring, the composition of the freshly-dug tubers shows slight variations, but of many analyses the average is—water, 75; protein compounds, 2; fat, 0·3; extract free of nitrogen, 20; crude fibre, 0·1; ash, 0·9. The analysis of the ash gives—of potash, 59; soda, 1·0; magnesia, 4·5; lime, 2; phosphoric acid, 19; silica, 2; chlorine, 3. Like all plants of the genus *Solanum*, the stems and leaves contain a poisonous narcotic principle; and the same is true of those tubers which from any cause have their surfaces exposed to sunlight and air during growth until they show a green spot at the point of exposure. Such should never be prepared and offered as food. The seed of the plant, or its fruit, is produced on the top of the aërial stems; it is called the potato-ball, being round, from half an inch to an inch in diameter, and when mature it is light yellow or straw-colored. There are in a ball many seeds, of the size of small bird-shot; they are enclosed in a cellular sac, and considered in mass are called the "pulp." Of late years some alarm has been caused by the fact that many, perhaps most, varieties were failing to produce seed, and various causes have been assigned for the result, only one of which can obtain as the general and controlling one. It is a law of both the plant and the animal world that failure to reproduce is a sure indication of malformation or constitutional weakness. The latter is undoubtedly the condition of many varieties of the potato, caused by forcing to make new varieties and to multiply them rapidly. To remedy the difficulty it may be necessary again to procure the vigorous wild plant from its native home, and improve it by feeding and cultivating judiciously until in quality it shall meet our requirements, at the same time retaining its prepotency. Different varieties of the potato, if planted in the same field, hill, or drill, will not "mix" or make new varieties of tubers; they "mix"—or, in other words, new varieties are produced—only in the seed in the potato-ball. The following is the method of accomplishing this result. The varieties to be crossed should be planted side by side or in the same hill, and at a distance from all others. If they are nearly identical in time of blossoming, the pollen of each will be carried back and forth to the pistillate organs, and cross-fertilization and new varieties will result. If they flower at different periods, the experimenter must take single blossoms which may develop before or after the plant is in *full* bloom, and with a hair-pencil, or, better still, with the staminate organ itself, convey the pollen to the other variety. When the seeds thus produced have ripened, they should be carefully washed from their adhering pulp, thoroughly dried, and preserved in a cool place excluded from the air. If the work of fertilization has been properly done, it is possible that only one new variety will be produced, but if otherwise, or where the cross has been produced without artificial interference, there may be many of unknown parentage and quality. The seed must be planted the following year, and the tubers it produces one or two years, that they may be fully developed, before the varieties and their qualities can be determined. There is hardly one of our cultivated plants which has taken so kindly to domestication as the potato, or which has been more radically improved and multiplied in variety. Many individuals are experimenting in this direction, and new varieties are brought to public notice almost every year, with qualities of earliness, productiveness, and table-value superior to those formerly known.

In practical potato-growing the so-called "seed" from which it is produced is the tuber itself, which may be planted whole or cut into as many pieces as there are eyes or buds, or any less number; and the aërial stems starting from the eyes may be plucked off when their roots are developed and planted. If it is desired to increase a variety with great rapidity, the tops or stems may be reduced to cuttings, with a node on each, and planted. These methods are simply a division of the plant, but are effective, and each will produce perfect tubers. The best seed to plant is the large, mature tuber, either whole or in pieces; but in case of a partial failure of the crop or a scarcity of a variety, half-grown potatoes may be used a year or two with no sensible deterioration from their original; if, however, the practice is continued longer, the final result will be injurious. When the seed is cut into two pieces, it should be lengthwise from stem to seed-end, to equalize the eyes on the halves and the nutritive matter of the tuber to them. If cut into as many pieces as there are eyes, each eye should be so taken out that its attached portion of the tuber shall extend from the surface to the centre. The plant is adapted to a cool, moist climate, and a strong, sandy-loam soil or one rich in decaying vegetable mould. If it is desirable to produce an early crop, a lighter sandy-loam soil may be selected, and it can be materially hastened by "sprouting the seed potatoes" in a hot-bed, or even in a pile of horse-manure and leaf-mould. In either case the potatoes should be laid on the manure with the cut surfaces down in such quantity that all shall be affected equally by the bottom heat, and covered two inches deep with garden-soil. When the sprout or haulm appears two or three inches above the soil, it, with its attached roots, may be carefully taken out and transplanted to the field, or, which is better, the piece of tuber and its sprouts can be transplanted. The young sprout is killed by slight frost, and all attempts by this method to force it in advance of the season will fail if it be carried to the field before the season of frosts is past. Potatoes planted in the comparatively cold soil develop their buds very slowly, even when there is no danger of frost; but when placed in the hot-bed they appear in a short time, and from one to two weeks may be gained in the ripening of the crop. The native habitat was in the cool or temperate climate of a mountain-region, and, notwithstanding all the changes made in its development and climatic adaptations by cultivation, it has always retained in a marked degree its native adaptation to a cool, moist climate. In strictly tropical countries it cannot be made a self-perpetuating crop, and in semi-tropical it must be frequently renewed by seed brought from higher latitudes. As a crop for an early northern market, potatoes of fair quality are grown in large quantities in the Bermuda Islands and the southern portion of the United States, but the seed for each crop should be procured from some northern locality.

By high manuring and skilful culture the potato can be successfully produced, retaining its power of reproduction without material deterioration, on almost any soil in the temperate zone, but it has a special adaptation for a new sandy loam or a peat-and-sand soil. Lands which have been long in grass, and either mown or pastured, if thoroughly tilled and made friable and porous, produce this crop abundantly and of good quality. The analysis above given of the ash of the tuber shows that it belongs to the class of potash plants, and indicates its manurial adaptation. Nitrogenous fertilizers, but especially unfermented farmyard manures, induce a great growth of tops at the expense of tubers, and cause such of the latter as are developed to be watery and deficient in starch; but the mineral manures, such as wood-ashes, the phosphates, and potash salts, diminish the top growth, increase the tubers in number and size, and cause them to store more starch, the granules of which burst on being cooked, giving a beautiful appearance and a delicious flavor. The last-named manures appear to impart staying qualities to the plant, so that it has more vital force for reproduction by the seed of the balls, or by dividing the tubers and developing the eyes, and the tubers retain their intrinsic qualities longer after harvesting.

The methods of cultivating the crop in open field-culture and on a large scale are various, and are somewhat modified by differences of soil, climate, cost of labor, and ability to procure the implements adapted to the work; but the method here detailed is the most common, and, all things considered, is believed to be the best. Whatever the variety of soil, it should receive the most thorough tillage; and whatever the manure, it should be applied broadcast and worked into the surface soil as early in the spring as the season and the condition of the soil will allow. Then with a light double mouldboard plough mark the field into rows from 3 to 3½ feet apart, according to the luxuriance of the variety to be grown, by furrows about 3 inches deep from the level surface. Good mature potatoes cut into two or more pieces should be used for seed, and these pieces dropped in the bottom of the furrow, one piece in a place, from 12 to 18 inches apart. The pieces can be covered with earth with a common hand-hoe, but it is cheaper, and the labor can be performed as well, to use a "ridger," an implement drawn by a horse. After the seed is covered, the whole field should be rolled, to press the soil to it and to aid the after-cultivation. If the weather for a week or two after planting is cold, the seed will start slowly, and weeds may begin to infest the ground before the sprouts appear on the surface; in such a case the whole field should be harrowed with a smoothing harrow, and this operation may be continued with advantage at intervals until the plants are three or four inches high, unless there are loose stones or other movable obstructions on the surface. Afterward, when the soil becomes compact or growing weeds are seen, a cultivator should be passed between the rows, and, as occasion requires, the ridger, which passes astride of the rows and turns a little soil to the plants. If possible, cultivation should be completed before the plants bloom, and no circumstances will justify its continuance after the tops have fallen. Such common hand implements as the hoe, spade, potato-digger, and manure-fork are used in harvesting the crop, but with the last a good workman can most rapidly throw them from the soil into a good position for picking. Machines have been patented for digging these roots where they are grown on a large scale, but they have hardly fulfilled the expectations of their inventors or supplied the want of farmers, and have had but a limited use. A very expeditious method of harvesting when the potatoes are grown in drills, or when the plants are but 12 or 18 inches apart, is to attach a pair of horses to a large double mouldboard plough, and, driving the team astride the drill, throw the tubers out of the soil. Following the plough with a common harrow will bring them to the surface with as little loss as is incurred in the use of the small implements in the hands of most workmen. Potatoes designed for market or home consumption should be "sorted" at the time of harvest, and those which are too small for table use or are defective should be utilized as stock-feed, and the whole crop after being dug should be allowed to lie long enough to dry on the surface before barrelling or putting into bins.

Potatoes intended for an early market may be harvested as soon as fully grown and ripe, but those intended for keeping through the winter and until the early crop of another year can be gathered should remain in the ground, unless it is drenched with water or the tubers are being injured by vermin, until the middle of October in the Northern States or until the steady cool weather of the late fall prevails. In general, the quality of this vegetable is at its best when first taken from the soil, if it is ripe. Some varieties retain their good qualities much longer than others, but all will deteriorate, especially if stored in a warm place. An excellent method of keeping potatoes in good condition through the long Northern winter is to place them in pits which will hold from 50 to 60 bushels, on dry ground, just before freezing weather begins, and then cover them with six inches of straw or other similar material, and this with two feet of earth. Out of the ground the best place to preserve them is in bins in a cellar from which all light is excluded and where the temperature is but little above the freezing-point. Owing to the natural habit of the plant and the temperature of spring and summer, the buds of tubers carried through the winter will be excited to activity and growth will commence; the starch and other elements of nutrition which they contain pass into circulation, and they become merely masses of cellular tissue and cells filled with water; to prevent this, their temperature should be retained at the lowest point possible and the sprouts removed as soon as formed.

Some of the large, coarse varieties and the imperfect tubers of others are extensively used to feed farm-stock; cooked with pumpkins and Indian meal, these make a food which is much relished by swine, and which soon puts them in condition for market. Fed raw to neat-stock when it is kept in the barn and the other feed is dry, they not only afford nourishment, but keep the animal organism in such a state that greater benefit is received from the dry food, and the general health is promoted.

Being rich in starch, these roots are often cultivated for the purpose of extracting it as a commercial product, and in some sections of the country, especially in Maine, Vermont, and Northern New York, the combined operations of cultivation and manufacture form an industry of much importance.

The whole product of the United States in 1880 was 167,659,570 bushels, grown on 1,842,510 acres, and valued at $81,062,214. Of the total production, New York furnished 32,571,900 bushels; Pennsylvania, 13,436,320; Wisconsin, 13,552,110; and Illinois, 11,193,750. The average yield per acre that year was about 90 bushels—a quantity so small as to make the cultivation unprofitable, but this must be the result of inattention on the part of cultivators, for almost any land with suitable tillage and fertilization should return from 150 to 200 bushels per acre. The returns from the extreme North-western States in 1880 were very meagre, but the soil and climate of that extensive region are perfectly adapted to the crop, the yield, wherever tried, is exceptionally large and of good quality, and in the near future the great cities of the Mississippi Valley will be supplied from that source. The immense demand for potatoes in New York and its adjacent cities, the high price they there command, and the ease with which they can be transported by water, have led hundreds of farmers on either bank of the Hudson River, nearly up to its sources, to put the larger part, and in some instances all, of their farms in this crop.

Potatoes may be said to be a sure crop and to require but little care and attention, yet the plant has diseases and insect enemies, either of which may cause its ruin if neglected. Of its diseases, that which has been most widely spread and followed with the most calamitous results is popularly known as the "potato rot." There is hardly a year when its effects cannot be found in some locality on a small scale, but in 1845 it was nearly universal on both sides of the Atlantic; the destruction of the crop was almost complete, and in Ireland, where a large majority of the people depend on it for food, the result was famine and great loss of life. Its appearance and development are peculiar: it makes its attack only in certain conditions of the weather and when the vines are in full foliage and both vines and tubers growing rapidly. The first indication of its presence is dark-brown or black spots on the leaves; these may increase so rapidly that in thirty-six hours the color of the field will be changed from a luxuriant, beautiful green to black; the leaf-stems hang drooping to the stalks, which take on a pale green, sickly appearance, and with the tubers begin to decay, filling the surrounding air with a very disagreeable odor. Such a complete ruin of the crop seldom takes place, and perhaps never has occurred except in the year named, but for the last thirty years the rot has caused more or less loss. When first observed, or when its extensive ravages arrested public attention, observing farmers and scientists were baffled in all attempts to discover its real nature or cause; theory after theory was advanced only to be discarded, and it was considered a matter of such public importance in Massachusetts that the legislature passed an act offering a bounty of $10,000 to any person who should discover its cause and cure. Many persons soon claimed to have made the discovery and applied for the bounty, but a trial of their theories and nostrums proved that they were of no avail, and the money was never drawn from the treasury. Rational microscopical examinations in due time determined the fact that this injury or total destruction of the crop is the result of a fungoid growth, the seeds or spores of which may often be found in the tissues of the plant undeveloped, but when warm and damp weather occurs at the right stage of the growth of the potato, or when the climatic and plant conditions are favorable, the fungus makes a rapid growth and spreads itself through all the tissues of the leaf-stem and tubers, robbing them of nutrition and causing death and decay. No specific remedy is known, but, other things being equal, it is found that early plants, and those which have been freely fertilized with mineral manures and are strong and vigorous, will suffer least, and a crop ripened before the 1st of August in the Northern States escapes injury.

The tubers of the plant have several insect enemies, but notably the wire-worm and the grub with a liver-colored head. Both eat holes in the tuber which destroy its market-value and even make it unfit for stock. They are both the form of aërial winged insects, and there is little defence from their ravages; but as they do not begin their work until the tubers are nearly or quite ripe, the latter can be measurably saved by early digging and the avoidance of farmyard manures, in which the insects breed rapidly. By far the most formidable enemy of the stems and leaves is the "Colorado potato-bug" or beetle (*Doryphora 10-lineata*). Its native home was in the cañons and eastern foothills of the Rocky Mountains in Colorado, and its natural food the wild solanum-plants of that region. When that country was opened up by settlers the insect migrated eastward along the line of settlement and immigration, and in fifteen years from the time of its first discovery it had spread over the entire country to the Atlantic seaboard, which it reached about the year 1875. The beetles, which hibernate in the earth in the winter, make their appearance early in May in the Middle and Northern States. Producing three broods in a season, if their increase is unchecked they soon become myriads, destroying not only the entire potato-crop, but other plants of the same species, notably the tomato. They usually lay their eggs, which are bright orange-colored, on the under side of the leaf in clusters, the average number laid by each female being about 600. The larvæ are hatched in about a week, grow rapidly, and eat voraciously for about two weeks, when they enter the soil, change to the pupa and then the beetle form, and appear above the ground. The entire round of transformations from beetle to beetle requires about four weeks. They move from leaf to leaf, consuming these and the tender portions of the stem, stopping the growth of the tubers and practically killing the plant. The insects have parasitic enemies which feed upon and destroy large numbers, but not enough to diminish perceptibly their ravages, and the farmer who would save his crop must resort to artificial methods for their extermination. (See COLORADO POTATO-BEETLE.) This is best accomplished by the use of some arsenical poison, such as Paris green or London purple. By the use of a vessel provided with a syringe nozzle an infusion of either of these substances can be showered upon the plants where the insect is feeding. Or, better still, the dry powder can be mixed with flour or finely-ground "land-plaster" in the proportion of one part of the poison to twenty parts of the plaster by bulk, and by the use of a fine sieve or tin box perforated with small holes can be sprinkled upon the plants when they are wet. In either case the poison adheres to the leaves and stems, and the insects partaking of it are destroyed. If a shower occurs soon after the application, the substance will be washed off, and the sprinkling must be repeated. The work should be done as soon as the first brood is hatched, and occasional attention afterward will save the crop. Care should be taken to see that animals do not feed upon the foliage after it has been poisoned, or that fowls do not feed upon the poisoned insects; but as arsenic is insoluble in water, it cannot enter into the circulation or affect the tubers, and if ordinary care is taken in cleaning them before use it is impossible that any of the substance of the poison should adhere to them or that harm should result from eating them.

Sweet Potato.—This is a perennial plant of the *Convolvulus* family, and is classed as *Ipomœa Batatas* or *Batatas edulis*. Though like *Solanum tuberosum* in being an enlarged growth of an underground stem, in many of its characteristics of development and quality it is very dissimilar. Its aërial stems are creepers, and in their general form leaf and flower resemble those of the morning-glory. It has been known as a cultivated plant from time immemorial, was found among the aborigines of Central America when that country was first visited by the Spaniards, and is believed to have been an important crop with the ancient Chinese. It is nowhere found in a wild state at present, and there is no positive knowledge of the place of its nativity; it is probable, however, that it is native to both the Eastern and the Western hemisphere. Its habit indicates clearly that it is tropical in origin, and though it has been acclimatized as far north as lat. 35° or 40°, yet it is more easily grown and the crops it yields are more satisfactory farther south and within the tropics. In the market only three varieties are known—viz., the yam, Southern Queen, and the Nansemond. The yam is rarely grown with success north of lat. 20° or 25°. The freshly-dug tuber contains—of water, 70 per cent.; protein, 0·04; fat, 0·03; extract free of nitrogen, 25; crude fibre, 2; ash, 1. In starch content and in the composition of its ash the plant is similar to the Irish potato, but it contains a much larger percentage of sugar. It was formerly considered emphatically a Southern crop, but its cultivation has advanced northward, until now it is grown in large quantities as an open field-crop as far north as New Jersey, and, with the assistance of the forcing-pit, in New York, Massachusetts, and Michigan. Its soil-adaptation is sand or sandy loam retentive of heat, with chemical fertilizers rich in potash for manures. If farmyard manure is used, it is the common practice to ridge the field into rows 3½ feet apart, and cover the manure in the ridges. It is a bad practice to plant the tubers or any part of them as seed, for few of them will send out sprouts in the open field. They are therefore cut into halves lengthwise, and placed with the buds up in moist sand in the hot-bed or forcing-pit. The heat soon causes the development of the eyes, and when the sprouts are two or three inches in length and well set with roots, they are pulled from the tuber and transplanted to the prepared ridges from 15 to 20 inches apart. The eyes from which the shoots are thus taken will send out others, and the process can be repeated until the nutritive elements of the tuber are exhausted. The after-cultivation is with the horse-cultivator and hand-hoe, and must be attended to in season, for the creeping stems of the plant will cover the entire surface of the field long before the crop is perfected. The plant sends out "joint-roots" at the nodes of the stems, which should be cut to prevent a great growth of tops at the expense of tubers.

It is rather difficult to keep the sweet potato after being dug from the soil, and the time of harvest must vary with the locality of growth, care being taken to avoid frost. The tubers can be preserved from two to four months in a dry, cold place in bins holding from 30 to 50 bushels, but to be carried through the winter to serve as the seed of the next crop they should be packed in dry sand and kept at a low temperature. Those grown in the Southern States contain more sugar and less starch than those produced at the North, and consequently are not so dry and "mealy" when cooked; but in either case the starch-granules are so changed by a few months' exposure to air that they become watery or "soggy." The seasons north of the central line of the States are so short that extra labor and care are required to secure a crop, which makes raising sweet-potatoes unprofitable as a business, and the market demand of the Middle States, which is very large, is mainly supplied from the South.

Beet.—This plant is of the genus *Beta*, of which many varieties are known, both wild and cultivated. Those most common are *B. vulgaris*, the common edible garden beet; *B. altissima*, or mangel-wurzel; and the sugar-beet, or *B. maritima*. All these varieties are now found growing wild along the shores of the Mediterranean Sea in Europe, Asia, and Africa, and that region is undoubtedly the place of their nativity. The exact date of the introduction of the beet to America is unknown, but it was included in the list of seeds sent for to England by Gov. Winslow of the Plymouth Colony about 1624. It is highly prized as a table vegetable in all the countries named, but in the quantity used for this purpose it takes a place secondary to potatoes, and to some of its varieties for stock-feed and the manufacture of sugar. The turnip beet and the long blood beet are grown in small quantities by all persons having vegetable gardens. They should be sown as early in the spring as the soil can be well worked, in rows or drills 18 inches apart. The seed may be sown so thickly that the young plants will touch one another in the rows, and when the leaves are well developed, but still tender and succulent, they should be thinned out for greens, leaving those from 4 to 6 inches apart to produce roots. As the soil, manure, and general mode of cultivating these varieties, except in the details given, are similar to, if not identical with, those required for the sugar-beet, the description of that variety will suffice for the whole.

All the varieties of beet are rich in saccharine matter, which is cane-sugar, and late in the last and early in the present century frequent attempts were made to manufacture sugar from it, but with little success. During the contests between England and France for supremacy, the emperor Napoleon interdicted all importation of English products to his empire, thus depriving his people of sugar, which they had generally received from the British West Indian islands. To supply the want he offered large bounties for the production of the article from plants grown on the soil of France. Stimulated by the offered bounty, and by the fact that the price of sugar rose to $1 a pound, experiments commenced in earnest with the beet, and soon sugar of fair quality was produced in considerable quantities at an expense of 30 cents per pound. The experiments began with a beet which contained only 3 per cent. of sugar, but the bounty and the high price of the article enabled experimenters to expend large sums in learning all the requirements of the plant as a sugar-producer and the best and cheapest methods of extracting and purifying the sugar. These efforts were crowned with such success that a beet was produced with a sugar content of 15 instead of 3 per cent., and its manufacture at a profit became an acknowledged fact. In due time the obnoxious decrees were repealed and the bounty was withdrawn, but the business continued to be a profitable one when placed in competition with English colonial sugars. The ability to produce a choice article from the beet in the soil and climate of France having been established, and the sugar demand giving opportunity for an unlimited expansion of the business, it attracted the attention of the people of other European countries, who soon engaged in it to such an extent that all except Russia now manufacture all they consume, and some export large quantities. The amount produced in Europe from the beet in 1879 was about 1,500,000,000 pounds, and of all the sugar which now enters into the commerce of the world or is consumed, 40 per cent. is produced from the beet. The sugar is chemically identical with cane-sugar, and if manufactured and prepared for market by the best processes cannot be distinguished from it. A large proportion of the article manipulated in the sugar-refineries of the United States is the product of the sugar-beet fields of Europe.

For the purpose of ascertaining whether the soil and climate of the United States could produce a beet containing sufficient saccharine matter to justify its manufacture, in 1879 the faculty of the Agricultural College of Massachusetts procured the seeds of several varieties of beets highly prized in Germany for the manufacture of sugar, and under the direction of Dr. C. A. Goessmann, professor of chemistry at the college, an investigation was conducted during three years, which demonstrated that seed from Germany produced as sweet a beet here as there, and that seed from the beet grown here produced a sweeter beet than that from the German seed. Since that time several attempts on an extensive scale have been made to produce sugar from the beet in Maine, Massachusetts, New Jersey, Delaware, Illinois, Wisconsin, California, and Canada; but from various causes all of these have been failures as business enterprises.

Roots *called* sugar-beets, but which are not up to the standard required for successful sugar-making, are often grown in considerable quantities for feeding cows kept for dairy purposes, and it is believed that they improve the general physical condition of the animal and give good quality and flavor to the butter, which is injured by the pungent qualities of some varieties of roots often fed.

Mangel-wurzel.—This beet, very commonly known by the name of "mangold," is a much larger plant in leaves and root, and of coarser texture, than either of those which have been mentioned. When it was brought to America, or where it originated, is not known with certainty. It develops less sugar than the other varieties, though its ash-composition is similar. One thousand pounds of the fresh root contain—of potash, 4·1 pounds; soda, 1·2; lime, 0·3; magnesia, 3; phosphoric acid, 0·6; sulphuric acid, 0·2; silica, 0·2. It is not so nutritious as the other varieties or as other edible roots; it contains—of water, 88 per cent.; of protein, 1; of fat, 0·1; of extract free of nitrogen, 9·1; and 0·9 of crude fibre. It is cultivated exclusively for feeding animals of the farm, and, being a rank grower and returning large yields, is preferred by most farmers. The plant requires a deep, rich soil of light clayey loam, prepared for the crop by deep tillage; it responds quickly to heavy manuring, which may be of farmyard manure applied directly to the crop or chemical fertilizers rich in some form of nitrogen. On lands remote from the sea-coast common salt, at the rate of 10 bushels to the acre, has proved a special fertilizer. The seed should be sown in drills 3 feet apart as early in the spring as possible, and the plants allowed to stand 18 inches apart in the drill. The field should be kept clean of weeds; most of the after-cultivation can be performed with a horse-cultivator, but as the plant has the habit of growing with several inches of its roots above the ground, care should be taken that these are not injured or broken. The roots are fed to all kinds of farm-stock, including swine, but, on account of the difficulty of maintaining an abundant flow of good milk when dairy cows are confined to dry feed in the barn, they are most valued for that class of cattle.

Turnip, a biennial plant of the genus *Brassica*, of which there are many species; this is *B. campestris*. Some varieties of the species are grown for their leaves and oily seeds, but the turnip is cultivated for its large fleshy root. There are several varieties or forms, known by different names, though there is a marked similarity of quality in all. Two varieties are especially known to cultivators. One of these is round and flat in form, but in consequence of some slight variation in color it is known by different names, as English turnip, flat Dutch, purple top, etc. The other is larger, more solid, and closer of texture, generally globe-shaped or elongated, and known by the common name of "rutabaga;" this is known in several varieties, as French turnips, yellow globe, Swedes, and Skirving's King of the Swedes. An analysis of the ash of these two varieties exhibits marked differences of composition. The flat turnip contains in 100 parts—of potash, 39; soda, 11; magnesia, 4; lime, 10; phosphoric acid, 13; sulphuric acid, 14; chlorine, 4; silica, 2. The rutabaga contains—of potash, 51; soda, 7; magnesia, 3; lime, 10; phosphoric acid, 15; sulphuric acid, 8; chlorine, 0·7; silica, 0·5. The nutritive composition of turnips is—water, 92 per cent.; protein, 1·0; fat, 0·15; extract free of nitrogen, 6; crude fibre, 10; that of rutabagas—water, 87·0; protein, 1·03; fat, 1·0; extract free of nitrogen, 10; crude fibre, 1·1. The turnip takes kindly to a rich sandy loam, but grows freely and is productive on a light clayey-loam soil; the former will produce roots of the best quality. High manuring with stable dung is often practised, but mineral manures, especially the phosphates, are better; in English husbandry phosphate of lime is considered a specific, and turnips are never grown without its use.

The turnip is cultivated both as a field and as a garden crop, and almost exclusively for the table. For summer use it should be sown in early spring, but in August the sugar and starch in this early crop are changed to woody fibre, and it becomes worthless; therefore, turnips for consumption during the winter should be sown in the Northern States between the 20th of July and the 10th of August. Harvested about the 15th of November and stored in a dry cool place in sand, and having the central bud cut out, they will retain their good qualities and remain tender until late the following spring. If the central bud is not removed, it generally becomes active in midwinter, and the root is ruined for table use. The seed is sown both in drills and broadcast; the first method is best in garden-culture, as proper cultivation is more easily secured. In this case the drills should be 20 inches apart, and the plants should stand from 6 to 8 inches apart in the drill. A method of growing them cheaply in the field is to sow half a tablespoonful of seed to the rod, broadcast, late in July, among standing corn which has been highly broadcast-manured for that crop, or to scatter the same quantity of seed per rod about the 1st of August on land that is being tilled, manured, and reseeded with grass. In this method no cultivation is given after sowing the seed; but, though it often produces remarkable yields, it is believed to be at the expense of after-crops, unless the soil is specially manured for the turnip.

The soil and manurial adaptation of the rutabaga are the same as those of the turnip, but it is grown only as a field-crop, and specially for feeding stock, though its keeping qualities make it desirable for the table late in winter or in the spring. To grow it in perfection a longer season is needed than for the turnip, and it should therefore be sown between the 1st and 20th of June. It should be put in drills 2½ feet apart, which can be done by sowing the seed; but a better method for the crop, and one which in the end will cost the least, is to sow the seed about the 1st of June in a well-prepared and manured seed-bed, and about the last of June transplant the young plants into the field-drills 1 foot apart. The advantages of this method are—1st, that the young plants are less liable to injury from the turnip-fly when standing thickly in the seed-bed than when scattered along the drill in the field; and, 2d, one or two weedings in the field, the thinning out, and filling in of gaps are avoided, thus materially lessening the cost of cultivation. Quite young plants of this variety have a tap-root 2 or 3 inches in length, and the farmer finds it difficult to transplant them and get the tap-root into the proper position at the proper depth to produce a good root when transplanting to fill vacancies in the drill after the soil has been trodden hard by the process of weeding or beaten down by rain; but if the operation is performed on a freshly-ploughed and well-tilled field with an iron or wooden dibble, it can be quickly and well done.

The roots are preserved for winter use in pits in the field, or in bins or large rooms in the barn-cellar. They should be kept as cool as possible without freezing, and if put in large quantities in a root-room they should have free ventilation by lying on a slatted floor with 1½-inch spaces between the slats and an open door in the top of the room; it is well not to put them into such large receptacles until winter sets in. Though the rutabaga is not nutritious as compared with some other foods, yet it is highly relished by cattle in winter and promotes their health and growth; but it cannot be recommended for cows in milk, as its pungent flavor is liable to affect their product unpleasantly. English farmers assert that the growing of the different varieties of the turnip has made a great and beneficial revolution in their system of farming, enabling them to lengthen their crop-rotation, to increase their sheep husbandry and make it more profitable, and to enrich their fields for the production of larger crops of wheat. The mild climate of England enables the turnip to remain in the field without injury through the winter, so that sheep can feed upon it on the ground, making the cost of its consumption and production small, and the result of the business one of profit.

Carrot.—*Daucus carota* is a biennial plant of the order *Umbelliferæ*. Its nativity is not certainly known, but, as it is found in its wild state in both Europe and America, it is possible it may be native in both. It makes a long, fleshy tap-root, averaging about 2 inches in diameter at its crown when fully grown, and light or orange-yellow in color. Its ash is composed of—potash, 35·7 per cent.; soda, 22·1; magnesia, 5·3; lime, 10·1; phosphoric acid, 12·5; sulphuric acid, 6·4; chlorine, 3·2; silica, 2. Its nutritive composition is—water, 86·9 per cent.; protein, 1·3; fat, 0·25; extract free of nitrogen, 9·6; crude fibre, 1·9. It is prized by many for table use, the small roots being used as a condiment or flavoring in soup, and the larger cooked and eaten with meats or stewed in butter as a special dish. Farmers recognize it as a more nutritious root than the turnip, and, though they feed it to all their domestic animals, it is especially valued for feeding horses and milch cows. Fed to the former, it appears to have about the same result as an equal measure of oats, and it commands from liverymen the same price per ton as good hay. Fed to the latter, besides the general improvement it makes in their health and condition, it is believed to be specially adapted to improve the quality of their milk and the flavor and color of the butter. The juice of the deep orange carrot, expressed after it has been crushed or grated to a fine pulp, is used as a "butter color," and it not only improves that, but gives the butter an agreeable flavor. Warm sandy-loam soil is the best for the carrot, and it should be most thoroughly fertilized and tilled. While fully believing in the great value of this root for feeding purposes, most farmers are disinclined to cultivate it as a field-crop, because it germinates, and at first grows, very slowly; the young plant is small and feeble, and the ground is liable to become infested with weeds before it is large enough to be seen in the drill; and it is laborious and costly work to weed the crop and keep the field clean. To avoid this, the same method of starting the crop should be adopted as has been recommended in the case of the rutabaga. Whether the field is stocked by sowing the seed or by transplanting, the plants should be in drills 2½ feet apart and 6 inches apart in the drills. The after-cultivation consists simply in killing the weeds and keeping the soil light by the frequent use of the hoe and the hand- and horse-cultivator.

Parsnip, an umbelliferous plant (*Pastinaca sativa*) with fleshy tap-root, and having most excellent qualities for the table or the stock of the farm, though but little used for the latter purpose. The plant is found in its wild state in Western Asia and Southern Europe, and is probably a native of the shores of the Mediterranean. It was known early in England, and was brought to America by English navigators, and planted here by the Indians prior to the date of white settlement. In quite recent times selections of the wild plant have been made which by cultivation for a period of ten years have developed varieties of superior excellence. The seed is composed largely of starch, with little oil, and is so thin-skinned that its germinating power is rarely retained more than one year. The nutritive content of the parsnip is—dry matter, 11·7 per cent.; protein, 1·6; fat, 0·2; extract free of nitrogen, 8·2; crude fibre, 1·0. Its carbohydrate content is large, especially in sugar, which gives the root a sweet taste and delicious flavor; but, though attempts to extract this sugar have been made, they have not been successful. The soil, manure, and mode of cultivation adapted to the root-crops which have been already described meet the requirements of the parsnip, and need not be detailed again. It is perfectly hardy, is not injured by frost, will remain in the soil during the severest northern winters without injury, but should be removed in the spring as soon as the frost is out, or the vital force will start the bud to growth to develop its seed-stalk, and the root will be ruined for the table. This plant and the carrot and sugar-beet develop their roots entirely within the soil, and the process of taking them out by hand or by hand implements is a laborious and slow one. Harvesting them with implements drawn by oxen or horses lightens, hastens, and cheapens the work, and is done by any one of the three following methods, as may best suit the circumstances of the cultivator. By the first method, a pair of horses or oxen are attached to a good common but deep-tilling plough, and driven across the field astride the row of plants to be taken up, running the plough close to, and turning a furrow from, them as deep as the power of the team will permit. One side of the roots is thus exposed, and they are easily loosened and thrown out into piles by men following behind the plough. The second method is by the use of the subsoil plough, which with a good strong team should be drawn through the soil beneath the plants, lifting them and breaking their fibrous rootlets, so that they can be easily thrown out into heaps. The third method is to use an implement made for the purpose, which is so constructed as to the space between its two plough-irons, and the depth at which they run, that when it is drawn across the field it throws out two rows of roots at each passage. Where very large areas are cultivated, as is often the case with sugar-beets, such an implement is indispensable.

Onion (*Allium cepa*).—This is a bulbous plant of the natural order *Liliaceæ*, and includes a great many varieties, both wild and cultivated. It belongs to the lily family, and bears an edible bulb which increases in size by leaf-growth at the centre. The earliest histories, both sacred and profane, mention the onion as a well-known and cultivated plant, which indicates clearly that it is of Asiatic origin, though in very remote times it was grown along the northern shores of Africa. There are many varieties of the onion, few of which, however, are of practical value for cultivation. These few are divided into two classes—those which produce seed and are reproduced by it, and those which develop small bulbs from the side of the parent bulb or on the top of the stalk, instead of flowers and seeds. The former of the two last named are called potato onions, and the last top onions, and neither are of much value as a market-crop. Of those produced from seed there are several varieties, but the most common, those which supply the market for home consumption and shipment, are the yellow Danvers, Wethersfield red, and silver skin. The last named is mild in flavor, and is grown only in small quantities for persons who dislike the pungent quality of the other varieties. The only known analysis of the bulb, made by Dr. C. A. Goessmann of Amherst, Mass., gave in 1000 parts, air-dry —of water, 892 parts; nitrogen, 2·120; ash. 4·362; potassium oxide, 1·680; sodium oxide, 0·083; magnesium oxide, 0·159; calcium oxide, 0·354; phosphoric acid, 0·689; sulphuric acid, 1·153; silicic acid, 0·145; iron sesquioxide, 0·027.

The peculiar pungent alliaceous odor of the onion, so disagreeable to some, is derived from a sulphurous oil, which volatilizes rapidly when the bulb is crushed or cut in the preparation for cooking. It is so acrid and powerful as to inflame the eyes and olfactory nerves of the operator to such an extent that it cannot be endured. This result can be easily prevented by putting a pared raw potato upon the point of the knife used in the process. When the potato becomes saturated with the pungent oil, as will be indicated by the presence of the alliaceous odor in the air, it should be removed and a fresh one put in its place.

The natural soil for this plant is a strong sandy loam or a light clayey loam, which should receive the most complete tillage. As might be inferred, wood-ashes, on account of the potash they contain, are a special manure for the plant, but it responds to high fertilization with rich nitrogenous manures, whether those of the farm or chemical compounds. It is essential that the crop should be planted early in the spring; therefore, to expedite the operation it is well to manure, plough, and harrow the onion-field in the fall; then, almost as soon as the winter snow is gone, it may be lightly harrowed and raked, and it is soon ready for the seed. In the vicinity of the Eastern seaboard cities, and wherever there is a dense population, onions are produced in large quantities by each of two methods: first, an early crop grown from "sets" and marketed in the summer when green; secondly, a crop grown from seed and sold late in the fall when dry and for winter use. The "sets" to be used in the first method are procured by sowing from 25 to 30 pounds of seed to the acre on moderately fertile land in drills. Properly cared for and tilled, onions will be produced from a quarter-inch to an inch in diameter, which will stop growing and "ripen off" by the falling of their tops about the last of August, when they should be gathered and stored in a cool, dry place until spring; they may be put in bins, but it is better to have them a foot or two deep on a floor, where they can be occasionally shovelled over. The following spring, as soon as it is possible to get the field ready, they should be planted out in rows 12 inches apart, with sets 2 inches in the row; if the land is freshly tilled, the work can be rapidly done by simply pressing them into the soil to the depth of an inch, and, after all are in, rolling the field with a light roller to press the earth to them. If the sets are of proper size, it will require 12 bushels for an acre. Ordinary garden-culture should be given; the sets will start quickly, and when they are about half grown, or from the 1st to the middle of June in the latitude of New York, they are pulled from the soil, the tops cut off about 4 inches from the bulb, and sent to market tied in bunches of four or six. This crop is partly consumed raw as a tonic or used as a condiment in soups. The profit of this mode of culture is very large, and the final return from the crop comes very quickly. When producing it from seed, the soil, tilth, and manure should be the same as when produced from sets. The seed should be sown as early as possible, and if the variety is the Wethersfield red, it will require 4 pounds of seed to the acre, in drills 20 inches apart; if it is the yellow Danvers, 5 pounds in drills 16 inches apart. With these quantities of good seed, if the crop develops normally, the field will be fully "stocked," and will not require thinning. Cultivation should be continued to destroy weeds and keep the soil porous until the tops are so large as to shade the ground. If they are sown early they will begin to ripen and the tops to fall early in September, unless a wet season and very rich soil continue a late growth; in this case the tops are broken down by some hand implement or by passing a garden-roller over them. When the tops are dead down nearly to the bulbs; they should be raked from the soil and spread over the ground exposed to the weather until the tops are dried to a mere tissue and closely shrunken over the central bud of the bulb. The dried tops can then be removed, and the crop, being in good condition for preservation, may be marketed. With proper care onions are not materially injured by frost, and can be kept in bins in the open field in the latitude of New Jersey, or in barns and sheds in Massachusetts, but care should be exercised not to bring them suddenly into a warm atmosphere when frozen. Some large cultivators carry their crops through the winter, to secure the high price of the spring market, by keeping them a foot or more deep on shelves in a house so constructed that it can be slightly warmed when the temperature falls below 10° or 15° Fahr.

The only insect enemy of the plant is the maggot, a small light-colored worm hatched from an egg laid on the young sprout by the onion-fly just above the surface of the soil. The worm penetrates the soil to the bottom of the forming bulb, and, entering it at the minute orifice at its bottom, eats out its tender germ and destroys it. Whole fields are sometimes destroyed by it, but generally it only destroys plants enough to thin the field below the point of great profit. The only known protection from the pest is to plant the seeds from 1½ to 2 inches deep, to which point the worm cannot penetrate. Such deep planting will prevent the germination of the feebler portion of the seed, and will require half a pound per acre more than shallow planting. It is a common practice to grow onions on the same land year after year, without rotation, and it has been done continuously for more than half a century. But the method is sometimes followed by a blast or "smut" which destroys the crop. It appears to be caused by a fungoid growth in the tissues of the plant, which is propagated by spores, covering the whole field and ready to start into active life as soon as there is a necessary condition of the atmosphere and plant. The only way to escape the plague is to seed the field to grass, and at a long distance therefrom select a new one for onions. (L. S.)

3. Tobacco.

Tobacco is an annual herbaceous plant of the genus *Nicotiana* and the natural order *Solanaceæ*. It has powerful narcotic properties residing in the leaves, and contains an active principle called *nicotine*, which is poisonous in an isolated form. The species generally cultivated in the United States is *Nicotiana tabacum*, which is a native of the warmer parts of America. Other species, or strongly marked varieties, are cultivated, such as *N. fruticosa* and *N. repanda*, in Cuba, and *N. rustica*, grown largely in Turkey and Southern Europe. The wide popularity of this singular plant, its commercial importance, and its habitual use as a stimulant, sedative, and remedy for ennui, constitute one of the most remarkable traits in the history of man.

Tobacco is grown in nearly all the States and Territories of the United States. Virginia, Maryland, North Carolina, and Connecticut are the oldest tobacco-producing States in the Union. The earliest records of the original thirteen colonies disclose traces of the tobacco-plant as a minor agricultural product in all of them. In Virginia, Maryland, and North Carolina, however, it became an article of merchandise, barter, and sale from the moment of their settlement. In Connecticut also it was early used as a medium of exchange. It was growing spontaneously on the plains of Virginia when the first English explorers travelled over them, just as it was in Hispaniola when Columbus landed there. How Raleigh discovered it in the "New Found Land of Virginia" in 1584; how Capt. Yeardley, deputy governor in 1616, advised the colonists at Jamestown to cultivate it as a business; and how it became the currency of the colony, by which trade was effected, real estate secured, and marriage portions were adjusted,—are matters known and chronicled in the annals of the time to which reference is made. Discoveries in Aztec tombs and the graves of the North American Mound-builders show that the practice of smoking tobacco was common on this continent long anterior to its occupation by Europeans. The tobacco-plant as first seen in this country evidently was not an exotic. All obtainable evidence concerning it leads to the conclusion that it was as much a native here as are the pines and the oaks. The primitive stock has undergone many changes and has been modified into many varieties in the three centuries that have elapsed since it attracted Raleigh's and Drake's attention; but these are the results of cultivation and climatic influences.

The following official table shows the tobacco-product of the States and Territories for the census years 1880 and 1870, with the acreage of 1880:

States and Territories.	1880. Acreage.	1880. Pounds.	1870. Pounds.
Alabama	2,198	452,566	152,742
Arizona.	1	600	100
Arkansas	2,064	970,220	594,886
California	84	73,317	63,809
Colorado	....	....	890
8. Connecticut	8,666	14,044,652	8,328,798
Dakota	7	2,107	
Delaware	5	1,353	250
Dist. of Columbia	2	1,400	
Florida	102	22,197	157,405
Georgia	1,057	231,198	288,596
Idaho	2	400	
14. Illinois	5,625	3,936,700	5,249,274
11. Indiana	11,955	8,872,842	9,325,392
Iowa	694	420,722	71,792
Kansas.	334	191,749	33.241
1. Kentucky	226,127	171,121,134	105,305,869
Louisiana	264	56,564	15,541
Maine	3	350	15
7. Maryland	38,174	26,082,147	15,785,339
13. Massachusetts	3,358	5,369,436	7,312,885
Michigan	173	84,333	5,385
Minnesota	167	70,389	8,247
Mississippi	1,475	415,248	61,012
9. Missouri	15,500	11,994,077	12,320,483
Montana	....	....	600
Nebraska	106	58,589	5,988
Nevada	2	1,500	25
New Hampshire	88	170,843	155,334
New Jersey	154	171,405	40,871
New Mexico	10	1,249	587
12. New York	4,938	6,553,351	2,349,798
6. North Carolina	57,215	26,986,448	11,150,087
4. Ohio	34,697	34,725,405	18,741,973
Oregon	46	17,860	3,847
3. Pennsylvania	27,567	36,957,772	3,467,539
Rhode Island	3	925	796
South Carolina	183	46,144	34,805
5. Tennessee	41,532	29,365,052	21,465,452
Texas	702	222,398	59,706
Utah	....	....	....
Vermont	83	131,422	72,671
2. Virginia	139,423	80,099,838	37,086,364
Washington Ter.	9	7,072	1,682
15. West Virginia	4,071	2,296,146	2,046,452
10. Wisconsin	8,811	10,878.463	960,813
Total	637,677	437,107,583	262,737.341

It will be noticed that fifteen States produced in 1880, as they did in 1870, more than 99 per cent. of all the tobacco grown in the United States in those two years. Their relative rank in 1880 is indicated by the numbers prefixed. Missouri, Illinois, Indiana, and Massachusetts produced less in 1880 than in 1870. Kentucky in 1880 produced 36 per cent. of the total yield of the country.

The production in 1840 was 219,163,319 pounds; in 1850, 199,752,655; and in 1860, 434,209,461. In 1881 and 1882 the number of acres planted was larger than in 1880.

Virginia has passed from the first to the second rank of producers of this staple, though occupying the first place for two hundred years or more. When people of that State migrated to the West they planted tobacco in their new homes. As Virginia was first in the order of settlement, so was she first in the appropriation and diffusion of *N. tabacum* in the territory of the United States. Kentucky and Tennessee, and subsequently Missouri, speedily attained high rank as tobacco-producing States, soil, climate, and the aptitude of their planters at once contributing to that end—the first-named State soon competing with Virginia in quantity, if not in quality.

In 1628 mention is made in the colonial documents of Virginia of "Pryor" seed, one of the germs from which sprung the plant now cultivated in the different States. "Oroonoko," the stronger, and "sweet-scented," the milder—the latter having a broad and the former a narrow leaf—were distinct classes at that date. The varieties of the time, as afterward, took their names from their producers, as in the case of the "Pryor." In 1620, 40,000 pounds of tobacco were sent to the "Virginia Company of London," over one-half yielding eightpence per pound, and the remainder not over twopence. When Rolfe, the husband of Pocahontas, was experimenting in 1616, tobacco was cured in heaps, but in 1617 a Mr. Lambert hung it upon lines to cure. For a while the latter mode was popular; subsequently a peg was driven into the stalk of each plant, which was then placed upon parallel poles. The curing-houses were airy wooden structures, only covered sufficiently to keep out the rain. The cure was effected by sunlight and heat and air, artificial curing by fire in closed apartments—now so general—being a method then unknown. Then, as now, however, the tobacco disease known as "house-burn" or "pole-sweat," arising from too close hanging, was common.

From 1600 to 1700 pounds to the acre were early grown on the best lands of Virginia, and from 400 to 500 on the poorer. At the outset the tobacco-leaves were bound in "hands," as they universally are now. In 1657 a hogshead of tobacco weighed 357 pounds; thenceforward to the date of the War of the Revolution the weight was increased to 500, 800, and 1100 pounds successively. When Charles I. sought to monopolize the trade the governor and council proposed to contract with the king for all of their tobacco at 3s. 6d. per pound delivered in Virginia, or 4s. delivered in London, and invited him to take at least 500,000 pounds at those prices.

In 1632 the law required all tobacco to be taken from the poles before the end of November, and the next year it had to be brought to the appointed storehouses for examination before the last day of December, the planters' price being then limited to ninepence a pound. False packing, or, as now denominated, "nesting"—that is, putting poor leaves in with good—was punished in 1658 by burning the parcel so packed. Planting and replanting after the 30th of June was prohibited in 1686, but in 1696 the prohibition was removed. In colonial days tobacco, after being packed in hogsheads, was rolled to the place of shipment, and in later times to market, in the manner now customary in the moving of ground- or lawn-rollers.

By 1709 the export of tobacco from the colonies was 28,858,666 pounds per annum, England taking yearly an average of 11,260,659 pounds, and the other importing countries of Europe 17,598,007. It was 40,000,000 pounds in 1746, England importing only 7,000,000. From 1763 to 1770, inclusive, the annual average was 67,780,000 pounds. In 1772 the export was 97,799,263, and the next year 100,472,007 pounds, falling in 1774 to 97,397,252, and rising in 1775 to 101,828,617 pounds. The War of the Revolution appreciably diminished the exports, the aggregate from 1776 to 1782 reaching only 86,645,533 pounds, of which nearly 34,000,000 became at sea the spoil of the English. When peace was restored in 1783, exports again increased. 267,311,000 pounds going abroad in three years, from 1787 to 1789, and from 1790 to 1799 817,937 hogsheads of leaf and 960,744 pounds of manufactured. As showing how general was the trade in tobacco in 1792, the following table of exports is of historical interest:

	Hogsheads.	Manufactured, pounds.
New Hampshire	3	
Massachusetts	1,221	110,525
Rhode Island	1,429	
Connecticut	105	
New York	1,952	1,600
New Jersey	5	
Pennsylvania	3,203	2,140
Delaware	8	
Maryland	28,992	780
Virginia	61,203	2,025
North Carolina	3,540	
South Carolina	5,290	624
Georgia	5,471	180
Total	112,422	117,874

Since that time there has been a large increase in the exportation. In 1821 the value exported was $5,648,962; in 1830, $5,586,365; in 1840, $9,883,957; in 1850, $9,951,023; in 1860, $15,906,547; in 1870, $21,100,420; and in 1880, $16,379,107. For the fiscal year 1882 (ending June 30) the export was 223,665,980 pounds, valued at $19,067,721.

The production, area, and value of the tobacco of the United States in the ten years between 1871 and 1880 are shown in the annexed table:

Year.	Pounds.	Acres.	Value.
1871	426,000,000	580,000	$41,748,000
1872	480,000,000	584,600	49,920,000
1873	506,000,000	653,000	41,998,000
1874	315,000,000	500,000	34,650,000
1875	522,000,000	710,000	41,760,000
1876	535,000,000	733,000	39,590,000
1877	580,000,000	745,000	40,600,000
1878	429,200,000	580,000	34,336,000
1879	472,000,000	638,000	49,560,000
1880	460,000,000	610,000	50,600,000
Total	4,725,200,000	6,333,600	$424,762,000
Annual average	472,520,000	633,360	$42,476,200

Virginia maintained, if not supremacy, at least equality, as a producer, to the commencement of the late Civil War. Other States then became more prominent, Kentucky leading all the rest, as she has continued to do to the present time. A change in the tastes of consumers has also had something to do in reducing the rank of Virginia. Improved varieties of leaf, and superior methods of curing and manufacture, in the West and South, have inspired an augmented relish for the products of those sections, and, accordingly, Virginia leaf is not considered as indispensable as it was formerly. Though occupying the second place as respects quantity, Virginia is still unrivalled as regards the quality of some of her leaf. Neither the United States nor the other tobacco-consuming countries of the world can dispense altogether with the rich and peculiar types now and always raised there.

From the seed first fostered in that State there are now in the United States not less than fifty popular varieties of domestic tobacco. Some of these varieties are named in the following classification:

CLASS I.—DOMESTIC CIGAR TOBACCO AND "SMOKERS."

Seed-Leaf and Havana Seed.

Connecticut seed-leaf.
"New England" seed-leaf.
Pennsylvania seed-leaf.
Wisconsin and Illinois seed-leaf.
New York seed-leaf.
Florida seed-leaf.
Ohio seed-leaf.

Other Cigar and Smoking Tobacco.

White Burley lugs.
American-grown Havana.
Perique.

Common Virginia, North Carolina, Missouri, Tennessee, Kentucky, Indiana, and Illinois lugs.
Fine-fibred Clarksville wrappers.
Kentucky and Indian cheroot and stogie wrappers.
Indiana kite-foot.

CLASS II.—CHEWING TOBACCO.

Fine-cut and Plug Fillers.

Fine-cut Burley.
Fine-cut Mason county.
White Burley fillers.
Virginia sun-cured and air-cured fillers.
Virginia flue-cured fillers.
Missouri air-cured fillers.
Kentucky, Indiana, Tennessee, Virginia, Maryland, and West Virginia fire-cured fillers.

Plug Wrappers.

Virginia yellow and mahogany.
North Carolina yellow and mahogany.
Western Kentucky yellow.
Hart county (Ky.) bright and yellow.
Mason county (Ky.) Burley.
Henry county (Tenn.) yellow.
Clarksville and Missouri dark red.
Missouri and Arkansas yellow.
West Virginia yellow.

CLASS III.—EXPORT TOBACCO.

English Shippers.

Bird's-eye cutting leaf (mottled Virginia and Western).
Brown-roll wrapper (Virginia or Western; clear red-brown leaf).
Spinning leaf (Virginia or Clarksville; heavy, fat dark leaf).
Spinning fillers, or shag (Virginia, and Ohio River districts of Kentucky; heavy cutting leaf).
Plug wrappper (Virginia; dark, heavy-bodied leaf).
Virginia navy leaf (Virginia, mottled sweet leaf; some from Kentucky).
Irish filler (Virginia and Western; fat, dark, heavy body lugs or common leaf).
Scotch elder (Virginia and some Western; thirsty, red-brown leaf).
Strips, used for same purposes as above (Virginia and Western), snuff lugs.

Continental Shippers to "Closed" (or Regie) Markets—France, Italy, Spain, Austria.

French Regie, A, B, and C; wrappers, binders, and fillers (Kentucky, Virginia, Maryland, and Ohio; two latter mainly for pipe-smoking).
Italian Regie (mainly Kentucky and Virginia).
Austrian Regie (Kentucky, Virginia, Maryland, and Ohio; Virginia and Kentucky strips).
Spanish Regie (mainly Kentucky and Virginia; for C's, common lugs).
Snuff lugs.

Continental Shippers to Open Markets.

Germany:
  German saucer (sweet, fleshy, mottled, or cherry-red Virginia or Kentucky leaf).
  German spinners (fat, dark, heavy body, fine-fibred Virginia or Clarksville).
  Ohio and Maryland spangled.
  Cigar-wrappers (dark, silky leaf, Virginia or Western).
  "Smokers" fat lugs.
Switzerland:
  Swiss wrappers (large, silky, dark-brown leaf, Virginia or Western).
  Swiss fillers (brown, fine-fibred Virginia or Western).
  "Swiss "smokers" (light-brown or mottled lugs).
Holland:
  Dutch saucer (mottled Virginia, Kentucky, or Tennessee leaf).
  Cigar leaf (Kentucky, Virginia, and seed-leaf).
Belgium:
  Belgian cutter, a light, yellow-brown leaf, well fired.
Norway, Sweden, and Denmark:
  Heavy Kentucky, Virginia, and Tennessee leaf, mainly for "spinning" and "saucing," with some Ohio, Maryland, West Virginia, Connecticut, New York, Pennsylvania, and Ohio smoking leaf.

African Shippers.

Liverpool African, long, dark-red and mottled Virginia, Kentucky, and Tennessee.
Boston African, long, light-brown Kentucky and Tennessee.
Gibraltar African.

Mexico, South America, and West Indies.

Baling wrappers, long, fat, heavy-bodied, black Virginia or Western.
Baling fillers, similar to the above, but shorter and inferior.

Percentage of Nicotine in Some of the above Types.

	Per cent.
Virginia, heavily manured	5.81
Mexican baler, heavily manured	5.60
Clarksville, Tenn., heavily manured	5.29
Virginia, French Regie	4.81
Virginia, heavy English shipping	4.72
North Carolina yellow	4.58
German saucer, Kentucky	4.55
Perique, cured in its juices	4.32
German, low grade Virginia	4.30
Perique, air-cured	4.25
West Tennessee stemmer	4.23
German, dark	4.15
New York, Wilson's hybrid	4.14
Connecticut seed-leaf, New Milford	4.06
French Regie, A	3.90
Pennsylvania seed-leaf	3.88
Wisconsin Havana seed-leaf	3.82
Connecticut seed-leaf, Hartford co	3.49
Pennsylvania seed-leaf, Lancaster co	3.47
Virginia sun-cured for plug tobacco	3.27
Perique air-cured, whole leaf	3.25
North Carolina yellow, best	3.15
Mason county (Ky.) cutting or plug	3.12
Ballard county (Ky.) bright wrapper	2.92
Owen county (Ky.) plug fillers	2.80
North Carolina bright wrapper	2.54
Hart county (Ky.) bright wrapper	2.69
New York Havana seed-leaf	2.53
Florida seed-leaf	2.38
New York seed-leaf	2.35
Connecticut Havana seed-leaf	2.21
Owen county (Ky.) cutting leaf	2.19
Ohio seed-leaf	1.93
Sweet-scented Wisconsin and Illinois	1.33
Connecticut seed-leaf	1.14
Pennsylvania seed-leaf	1.02
Wisconsin and Illinois seed-leaf	0.86
Little Dutch, Miami Valley (O.) seed-leaf	0.63

Seed-leaf, as classified in Table I., is chiefly used in the making of cigars. Within fifty years it has advanced from a subordinate to a commanding rank, representing, with White Burley included, nearly one-third of the crop of 1879. The average annual export demand for this class of tobacco is under (rather than over) 20,000,000 pounds, since it has competitors in Europe in cognate varieties grown in Brazil, Java, Sumatra, and Germany. Germany, however, is the principal importer of it. The cheaper products of Ohio and Wisconsin constitute at the present time the bulk of the exports, but they are supplemented by similar, as well as the better, growths of the other seed-leaf States.

The class of tobacco known as seed-leaf was first brought into favor, if not into existence, in Connecticut. There, apparently, it originated, and thence certainly its seeds were distributed to all the States that now cultivate seed-leaf. It was grown in Hartford county, in that State, as early as 1812. In 1824, when the first consignment was received in New York, perhaps 2000 pounds were grown in all the States, while in 1880 the combined product of Connecticut, Massachusetts, New York, Pennsylvania, Ohio, and Wisconsin was 108,529,079 pounds. From that small beginning has developed the great commercial and manufacturing interest now identified with this staple. It was not until the half-decade between 1835 and 1840 that Connecticut seed-leaf obtained a recognition in trade, and even then 3,000,000 pounds were more than enough to satisfy the demand. Thenceforward its production and consumption rapidly increased, its comparatively larger size, fineness of texture, flexibility, elasticity, and good burning qualities making it a desirable substitute for the foreign varieties in use, especially when used in conjunction with them as wrappers for cigars. The preference for many years evinced for it has latterly in some degree abated, owing to its tendency to cure lighter in color than now comports with the bias of consumers. This is noticeably the case with a considerable portion of that produced in and adjacent to the Connecticut River Valley—once held in the highest esteem—where the soil is somewhat deficient in loam, rotation has not been sufficiently practised, and perhaps too liberal use has been made of commercial fertilizers. This blemish is less conspicuous in the valley of the Housatonic River, where the farms are richer than those of the Connecticut Valley, and have not so long been devoted to tobacco. In 1862 the product of the entire Housatonic Valley did not exceed 400,000 pounds; now it annually approximates 5,000,000 pounds. Connecticut seed-leaf has distinctive merits which will perpetuate its popularity and ensure prices equal to the best, whatever the fashion in respect of color.

Pennsylvania seed-leaf has been for the past ten years the favorite variety of this class of tobacco. Leafy, elastic, aromatic, dark, it has gradually risen in public estimation. It possesses all the excellence of competing kinds, and is free from many of their defects. Of the tobacco of Lancaster county, where the larger part of the crop of the State is harvested, and also of that of York county, this is especially true. Essentially heavy-bodied and gummy, it resists artificial sweating, to which cigar-manufacturers are now in the habit of subjecting tobacco, better than any other kind, and seems to show better results from the process. So high is its present status that only carelessness in cultivation and curing can effect a diminution of the esteem in which it is held.

The earliest of the varieties of tobacco grown in York and Lancaster counties was raised from Kentucky seed, principally along the Susquehanna River, and was familiarly known as "shoe-string" tobacco. It sold at from $1 to $3 per hundred pounds, and was used for the making of cheap cigars, which brought about $1.25 per thousand, wholesale. In 1837 some Havana tobacco-seed was distributed in York and Lancaster counties. The product of this seed proved superior to that previously gathered, and was the germ of the Pennsylvania seed-leaf of the present day. The first growth amounted to about fifteen hogsheads, or perhaps 12,000 pounds. The crop of 1838 was packed in cases, instead of hogsheads, as had become the practice in Connecticut. By 1840 the product of the two counties named was fully 400,000 pounds, or 1000 cases of 400 pounds each. In 1850 about 2500 cases were placed upon the market. The product of the State in 1870 had only reached 9000 cases, while in 1880 it amounted to over 92,000. Its expansion in the past ten years is one of the remarkable circumstances of the time. Portions of several counties are now devoted to the production of tobacco, but Lancaster and York are foremost in the scale of production.

Prompted by the success of seed-leaf culture in Connecticut, farmers in the valley of the Chemung River, Chemung co., N. Y., commenced its cultivation in 1850. The yield there since has amounted to as many as 10,000 cases in a single year, but latterly has not averaged more than 3000. Tobacco is grown in several counties in the State of New York, Onondaga producing the largest quantity. The reputation of the crop of the State is good, though its value averages lower than that of Connecticut or Pennsylvania.

A citizen of Rock co., Wis., planted in 1856 or 1857 the first seed-leaf grown in that State. Connecticut seed, followed by Connecticut and Pennsylvania "broad seed-leaf," was used. The average price is about twelve cents a pound; that is, nine for seed-leaf and fifteen for Havana seed. This is a little lower than in any other State except Ohio. Seed from Ohio of approved character is now in use in Wisconsin. Dane and Rock are the principal tobacco-growing counties there. About two-thirds of the crop of the State is Havana seed, which was first planted there in 1877, and is highly esteemed.

Seed-leaf, like other varieties of tobacco, is grown in nearly every State, but Connecticut, Massachusetts, New York, Pennsylvania, Ohio, and Wisconsin are the chief sources of this staple. In each of these tobacco grown from seed imported from Havana, Cuba, under the name of "Havana seed-leaf," is now extensively raised, and is employed in the manufacture of cigars. Like the "White Burley" of the West and Southwest, which is at present regarded as indispensable in the manufacture of chewing and smoking tobaccos, it is a valuable and attractive adjunct of the domestic tobacco-crop.

White Burley tobacco originated in 1864 near Higginsport, Brown co., Ohio. A Mr. Webb planted seed obtained from Bracken co., Ky., that year, some of which grew and cured into an entirely new kind of tobacco the following year, the leaves having a pleasing shade of color between white and yellow. From the seed sown in 1866, 20,000 pounds of tobacco were harvested, which brought $58 per hundred pounds at the St. Louis Fair in 1867. Cincinnati is the principal market for the sale of White Burley leaf, as for other styles adapted to cutting.

The leading leaf-tobacco markets of the United States are New York, Louisville, Cincinnati, Baltimore, Richmond, Philadelphia, and Lancaster. New Orleans and St. Louis in this connection are less prominent than in former years, and with Petersburg, Lynchburg, Danville, Va., Winston, N. C., Clarksville, Tenn., Paducah, Hopkinsville, and Henderson, Ky., York and Wrightsville, Pa., and Edgerton, Wis., occupy a plane below the seven first named.

In Florida the Gadsden seed, a product of Cuba, is mainly grown. It is used for cigars and named from Gadsden county. Louisiana produces Perique—chiefly in St. James parish—which is used for smoking tobacco and cigarettes, and also for snuff and chewing to a limited extent. This tobacco derives its name from a Spaniard who settled in the parish in 1820, and there commenced its cultivation. Perique first sowed Kentucky and then Virginia seed. The tobacco is put up in carrots of 3½ to 4 pounds each, which were formerly required to bear internal-revenue stamps denoting that the tax upon them was paid, the Government treating this variety in an exceptional manner, assuming that the way in which it is prepared for market rendered it subject to the tax imposed on manufactured tobacco. This tax was abolished by Congress in January, 1883. Perique tobacco is fermented in pots; the carrots are enveloped in muslin and pressed and bound with cords. After fermenting the leaf becomes jet black, and when perfectly cured reveals qualities that are highly prized and quite distinct from those of other varieties.

Within a few years the yellow tobaccos of the Piedmont section of North Carolina, and especially of Granville and Catawba counties, have become exceedingly popular for smoking and wrapping, approximating in quality, appearance, and price the finest growths of Virginia; some of the best commanding more money per pound than is usually obtained in Virginia, the large local manufactories making a ready and remunerative market for it.

In California but little tobacco is raised, though the soil and climate are well adapted to its growth. The plant seems to be indigenous there as elsewhere on the continent of America. About twenty years ago a Mr. Culp commenced cultivating and manufacturing tobacco in that State. His methods, known as the "Culp process," were of a scientific and technical character, and are used by the few who produce leaf tobacco in California at the present time.

The cultivation and curing of tobacco differ in the different sections of the country. Curing, for example, is effected in the West and South largely by the use of fire, while in the seed-leaf States all tobacco is air-cured. Seed is sown in the plant-beds in the West and South in February and March; in the seed-leaf States, in April. Transplanting usually begins in the first-named sections about the middle of May, and is continued in June. In the last named the plants are transferred from the beds to the field, as a rule, about the 1st of June, sometimes earlier, much depending in both instances upon the character of the season. The Western and Southern crops require from ninety to one hundred days to mature in the field, but for seed-leaf from sixty-five to eighty days suffice for that purpose. Unpropitious seasons and the ravages of worms delay both the planting and maturing of tobacco. Plant-beds are manipulated in divers ways, but usually brush is burnt over them as a preliminary step, and they are fertilized according to the fancies and preferences of their owners. In the bed, as in the field, tobacco needs a large quantity of manure to promote rapid growth, and every variety, in conjunction with poudrettes, phosphates, guanos, composts, lime, and salt, is employed on lands devoted to its culture in all the States. A bed ten paces square will produce enough plants to set five acres. There are about 875,000 tobacco-seeds in an ounce. Plants are set in the field in parallel rows from 3 to 4 feet apart—the latter for the broad-leaf varieties—with a space ranging from 30 to 36 inches between the plants in the row.

Worms begin to be troublesome soon after planting, the *Sphinx Carolina*, the most destructive, appearing in greatest number in the latter part of July and in August. Owing to the ravages of the first brood of worms, plants have frequently to be reset many times. The work of cultivation after plants have fairly started in the field consists in worming, hoeing, watering (in seasons of drought), topping, and "suckering;" the last is the name given to the operation of removing the false leaves or excrescences that grow out of them. These varied duties absorb the attention of cultivators up to the moment of harvesting, and are of universal application. Most of the seed-leaf is harvested in August, some being gathered in September. Western and Southern leaf is garnered in September at the earliest date and in October at the latest.

"Topping" is the pinching out or breaking off of the seed-buds, which should be done as soon as the buds are visible. When they are removed, the plants increase in girth and weight. Some farmers top so as to leave eight leaves to the stalk, others ten—which is common South and West—and still others twelve, fourteen, and even sixteen. The lower the topping, the broader and heavier the leaf, as also the more uniform and valuable. Usually, topping is practicable about seven weeks after planting.

Harvesting—or, as it is called, cutting—in the seed-leaf sections consists in severing the stalk at the base close to the ground when the leaves are ripe, allowing each plant to wilt two or three hours, so that it may be handled without fracture; suspending by means of spear puncture or hooks through the thick ends of the stalks from six to eight plants on an ordinary plastering lath; placing the filled laths on field scaffolds or wagons constructed for the purpose, and conveying them to the curing-houses. Formerly each plant was fastened with twine to a pole to cure, and at one time the plants were fastened to the poles with nails. Seed-leaf curing-houses are so constructed as to admit of a free circulation of air in all parts, the volume and character of which are subject to the control of the persons in charge. The tobacco is hung in tiers on the laths on which it is brought from the field; it cures in a few weeks in the air thus distributed; is then stripped—the leaves being taken from the stalks and done up into hands of from eight to twelve leaves each, fillers, seconds, and wrappers being carefully separated; packed in cases of from 375 to 400 pounds each; permitted to ferment (or "sweat," as it is termed) therein until about the 1st of September, a year after housing; when, after official inspection and sampling, it becomes ready for sale and use. Dealers are in the habit of reassorting this tobacco even after it has passed from the stripping- and assorting-rooms of the growers. As a rule, dealers buy it in bulk of the growers—sometimes while growing—and assort and pack according to their tastes and the demands of the trade.

The tobaccos grown in the Southern and Western States for conversion into chewing and smoking tobacco are treated differently. Harvesting commences with the splitting of each stalk, as it stands in the hill, through the centre, from the top to within a few inches of the bottom leaves—priming, which is the elimination of the ground leaves, as well as topping, having already been done—and ends with the severing of the stalk at the base, as in the case of seed-leaf; the placing of the stalks after wilting, six to ten consecutively, astride of rived sticks 1 inch in diameter and from 4 to 4½ feet in length, and their subsequent conveyance to the curing-house, or retention on scaffolds in the field, according as they are to be air- or fire-cured.

Heavy-bodied tobaccos are generally fire-cured, as are some of the most beautiful varieties of yellow and gold-colored leaf: the latter frequently, however, disclose the best specimens when sun- and air-cured. Burley and other cutting tobaccos are usually cured at present by natural process—that is, without fire. Firing is indispensable in the curing of the rich, fat, heavy tobaccos of the South and West. When subjected to artificial heat in this way, leaf that would require many weeks by air-drying to become divested of water and assume the color desired for it is perfected in a few days—from four to six. In Maryland, Virginia, North Carolina, Kentucky, Tennessee, Missouri, and a part of Ohio fire is used, and always has been, in curing tobacco, though in all of them both sun- and air-cure are common for the treatment of some of the tobacco-product. Tobacco in those States is hung in tiers in closed buildings, and the fires made under them —sometimes between logs arranged for the purpose, and sometimes in patent flue-conduits, which, besides thoroughly heating the premises, carry off the smoke, that otherwise would injure the tobacco. The temperature of fire-curing houses is started at about 90° Fahr., and gradually advanced to 170°. The following is the range for curing bright wrappers:

	Degrees.	Hours.
Steaming or yellowing process..	90	36
Fixing the color......................	90 to 95	1 to 2
" "	95 to 100	2
" "	100 to 105	2
" "	105 to 110	1 to 3
" "	110 to 115	2
" "	115 to 120	2
Curing of leaf........................	120	4 to 8
Curing stalk and stem............	120 to 170	

advancing within this interval 5° per hour till both are cured.

In the States last mentioned, when tobacco is stripped—which as a general thing occurs between January and March—the hands for ordinary prizing are made up of from six to ten leaves, and for "stemmers"—who prize for foreign account—of from fifteen to twenty leaves. Both in stripping and assorting the leaf is graded and classified with extreme precision, so that leaf, fillers, and lugs are all kept apart, and even subdivided into types involving different lengths, shades of color, and degrees of strength. These tobaccos are variously packed—or "prized," as encasing is denominated—in bales, tubs, tierces, and hogsheads, the latter chiefly. The weights of hogsheads of tobacco vary materially. For statistical record the United States Government estimates their average weight at 1200 pounds each, but they range from 500 to 1700 pounds. The tobacco grown in the West and South is inspected and sampled by persons duly appointed—by State authority in some instances—and like seed-leaf is sold on the guarantees of the inspectors, who are responsible for reclamations, in all the markets of the world.

In 1880 the home consumption of leaf tobacco in the United States amounted to 200,330,222 pounds. In 1881 and 1882 the consumption was considerably increased. In 1880 there were in the United States—

Manufacturers of tobacco and snuff	917
Manufacturers of cigars and cigarettes	14,228
Dealers in manufactured tobacco	395,215
Dealers in leaf tobacco	3,993
Peddlers of manufactured tobacco	1,424

The United States internal revenue system was inaugurated Sept. 30, 1862. To June 30, 1872, the tobacco industry paid to the Government in taxes $194,572,042. Its contributions since have been as follows:

In 1873	$34,386,303.09
1874	33,242,875.62
1875	37,303,461.88
1876	39,795,339.91
1877	41,106,546.92
1878	40,091,754.67
1879	40,135,002.65
1880	38,870,140.08
1881	42,854,991.31
1882	47,391,988.91
Total (from Sept. 30, 1862)	$589,750,447.04

(E. B.)

Manufactures of Tobacco in 1881 and 1882.

	Receipts 1881.	Receipts 1882.	Quantities taxed 1881, No.	Quantities taxed 1882, No.
Cigars and cheroots	$16,095,724.78	$18,245,852.37	2,682,620,797	3,040,975,395
Cigarettes	992,981.22	972,570.10	567,395,983	553,401,328
[1] Manufactures of cigars	142,273.02	143,859.66		
			Pounds.	Pounds.
Snuff, all descriptions	689,183.03	778,650.87	4,307,394	4,866,568
Tobacco, manufactured	22,833,287.60	25,033,741.97	142,664,637	156,458,033
Stamps for tobacco, snuff, and cigars for export	6,852.40	6,606.06		
[1] Dealers in leaf tobacco, not over 25,000 pounds	4,547.44	6,290.65		
[1] Dealers in leaf tobacco	76,996.76	76,305.81		
[1] Retail dealers in leaf tobacco	1,645.83	1,937.51		
[1] Dealers in manufactured tobacco	1,976,071.55	2,094,536.21		
[1] Manufacturers of tobacco	9,169.55	8,762.48		
[1] Peddlers of tobacco	26,258.13	22,875 22		
Total	$42,854,991.31	$47,391,988.91		

[1] Special tax.

4. SPECIAL CROPS.

SORGHUM.

(*Sorghum; Sorgho; Sorgo; Sorghum saccharatum; Sorghum sucré; Chinese sugar-cane; Imphee.*)

In the year 1851 there were introduced into France, from China, some seeds of this plant, which were propagated, and in 1854 some of the seed was brought from France to the United States and distributed over the country.

In 1857 there were imported into the United States, from Natal, South Africa, thirteen varieties of sorghum-seed, which, in distinction from the Chinese varieties, were called *imphees*. These imphees were mainly distributed in the States of Georgia and South Carolina. From these, and probably later importations of seed, have been produced very many varieties, which are grown over a wide extent, but especially in the West, South, and South-west of the United States. It is probable that at least thirty or forty varieties of this plant, differing in habit more or less, are at present under cultivation in this country, and, owing to the fact that they have generally received local and trivial names—as, *e. g.*, goose-neck, sprangle-top, honey-cane, sumac, etc., etc.—it is quite impossible at the present time to determine whether any given variety is from the original Chinese or African source. Indeed the the same variety has been sent to the writer under the names of Chinese and Liberian.

In general, the habit and appearance of the plant very nearly resemble those of maize or Indian corn, or more nearly broom corn, which is, in fact, a variety of sorghum, and it appears to flourish upon such lands as are adapted to maize; and since 38 per cent. of all the cultivated lands of the United States, including even the grass-lands, is at present devoted to the culture of maize, it will be seen how wide a cultivation of the sorghum is possible in our country.

The latest report of the census places the product of the sorghum-crop at an annual aggregate of $8,000,000. Indeed, it is worthy of note that this plant is the only one of wide cultivation which has been introduced into the United States since our colonial history, and which has attained sufficient importance to be especially enumerated in the census.

The many varieties of this plant (and some forty, more or less distinct, have, during the past four years, been made the subject of a very exhaustive examination at the Department of Agriculture at Washington, D. C.) differ widely in height, weight of stalk, development of the panicle or seed-head, and especially in the period required for the plant to attain maturity, this period being from 80 to 180 days from the time of planting the seed.

The presence of sugar in the juices of these plants has long been recognized, although, so far as known, sorghum has been grown in China and South Africa for centuries exclusively for its seed and as forage for cattle. In China sorghum is grown over a wide area, practically filling the place of maize in our own country. The seed of sorghum, in its proximate constitution, is practically identical with that of maize, and a product per acre equal to that of maize is obtained.

During the past twenty-five years more or less attention has been given to the production of sugar from this plant in the United States, and although the production of syrup has generally been found abundant and profitable, the results, so far as the production of sugar is concerned, have proved generally unsatisfactory. The reason for this continuous failure has been largely, if not entirely, due to the fact that the farmers have been accustomed to work up their crops of sorghum at a period in the growth of the plant too early for the full development of its sugar.

The variety of sorghum known as "Early Amber" has attained a high reputation, and is by many supposed to be of peculiar value as a source of sugar. This is owing to the fact that when the farmer was ready to work up his sorghum-crop this new variety happened to be ready for him—*i. e.*, it had attained such a degree of maturity that the content of sugar was nearly at its maximum. Of those varieties which have been generally grown in this country, especially at the West, there have been few or none which ordinarily would, during the season, attain their full content of sugar, and when the syrup made from such varieties would crystallize it was quite exceptional.

No careful and continuous examination of these plants during their successive stages of development for the purpose of determining the period when the sugar was at its maximum was made until the recent exhaustive work at the Department of Agriculture at Washington.

The following table gives the average results from the examination of thirty-five varieties of sorghum during the successive stages of development, obtained during the year 1881 at the Department of Agriculture. Between the successive stages after the sixth there was an interval of time equal to the average number of days intervening between the earlier stages, but these stages could not be indicated by any physical peculiarities of either seed or plant. It will be observed that the table represents the average results of over 400 analyses, and that there is up to the ninth stage a constant increase in the sugar and in the specific gravity of the juices, with a slight increase in the solids not sugars, and a slight diminution of glucose. The available sugar is the difference between the sum of the solids not sugars and the glucose and the sucrose present in the juices; and it will be seen that this available sugar is a *minus* quantity up to the time when the seed is in the *dough* state, and that from that time forward it steadily and rapidly increases until it attains its maximum at the ninth stage, when the average result of forty-five analyses of the thirty-five varieties shows an amount of available sugar equal to 11·77 per cent. of the juices. These results show the different varieties of sorghum to contain an amount of sugar fully equal to the true sugar-cane, and very many experiments have shown that this sugar is as readily attainable by the same processes and with the same apparatus used for the extraction of sugar from sugar-cane:

Average Analyses of the Juices of Thirty-five Varieties of Sorghum, made at the Department of Agriculture, Washington, D. C., 1881.

	Panicle just appearing.	Panicle full out.	Panicle in full blossom.	Seed in milk.	Seed in dough.	Seed dry and hard.	Seventh stage.	Eighth stage.	Ninth stage.	Tenth stage.
Per cent. sucrose....	·82	1·84	2·78	4·71	7·47	10·00	13·06	14·34	16·61	15·23
" glucose...	2·31	3·35	3·43	3·86	3·70	2·96	2·47	2·22	1·83	1·75
" solids	2·40	2·41	3·18	2·81	2·63	2·90	2·98	2·90	3·01	3·65
" juice	65·30	69·46	68·18	67·21	66·76	65·84	62·30	63·54	66·51	67·72
Specific gravity	1016	1029	1033	1042	1052	1061	1071	1077	1081	1080
Per cent. available sugar	−3·89	−3·92	−3·83	−1·96	1·14	4·14	7·61	9·22	11·77	9·83
Number of analyses.	16	40	46	42	45	53	40	37	45	43

It will be seen from the preceding results that after the time when, according to previous theories, the cane should be cut and worked up—viz., when the seed is in the dough state—the juices of these plants increase in their content of sugar over 122 per cent., diminish in glucose over 50 per cent., and *increase in their available sugar over 932 per cent.* Nor can this increase be regarded as in the nature of a concentration of the juices by the drying up or evaporation of the water of the plant, since, as will be seen, the increase of the constituents of the juices is by no means proportioned to the diminution of the juice obtained; nor is there a uniform increase in the several constituents of the juices, the solids not sugars remaining, as will be seen, practically constant, with a great *increase* in the sucrose and a *decrease* in the glucose.

These changes can only be regarded, then, as chemical changes going on within the plant after its function of developing and maturing its seed has been accomplished. The constant rise in specific gravity of the juices affords a convenient means for the estimation of the sugar present, and for learning the period when the crop may be most profitably worked for sugar.

The cultivation of sorghum is practically the same as that of maize, it being planted in drills or hills according to the custom of the country or the nature of the ground. On good land the drills may be 3 feet apart, and the stalks at a distance of 3 or 4 inches apart in the drill. The weight of stripped stalks which may be obtained on good land varies from 12 to 30 tons, according to the variety of sorghum grown. The height of the plant also varies from 9 to 15 feet, according to variety.

The details of manufacture are identical with that of the sugar-cane. (P. C.)

SUGAR FROM CORNSTALKS.

So early as 1606, Capt. John Smith, in the history of his travels, records of Indian corn that "the stalke hath a sweet juice in it, somewhat like a sugar-cane, which is the cause that when they gather their cane greene they suck the stalkes." In a letter from Abigail Adams to her husband, John Adams, Sept. 24, 1777, she says: "An instance may be seen in the progress which is made in grinding cornstalks and boiling the liquor into molasses. Scarcely a town or parish within forty miles of us but what has several mills at work. No less than eighty [barrels of molasses] have been made in the small town of Manchester. They have a method of refining it, so that it looks as well as the best imported molasses." In 1717 a patent was granted by the colonial government of Connecticut for making molasses from cornstalks, the condition imposed being that it should be made as cheap and as good as the West India molasses.

Although the presence of crystallizable sugar in the juices of maize has long been known, the efforts toward its extraction appear to have been unsatisfactory. The interest in this matter has recently revived, and more thorough investigation renders it probable that the stalks of maize may be utilized as an economical source of sugar.

In the years 1880 and 1881 careful analyses were made of the juices of many varieties of common field maize, and it was found, as in the case of sorghum, that the sugar content increased with the maturity of the plant, and the maximum was not attained until the grain had matured. It appears therefore established beyond question that there is the possibility of securing the ordinary crop of ripened grain, and also the sugar from the stalks, as has been shown to be true of the sorghums.

In two successive years there was obtained at the Department of Agriculture at Washington, D. C., a large crop of ripened corn, which in 1880 amounted to 69 bushels shelled corn to the acre, and from the stalks upon which this grew good sugar was obtained at the rate of over 900 pounds per acre. The average results of these juices from cornstalks, the specific gravity of which exceeded 1·055, are given in the following table (the analyses were made at Washington):

Average Results of the Analyses of Maize Juices.

	1880.	1881.
Per cent. of juice obtained..............	53·43	54·60
" sucrose in juice...........	11·30	11·72
" glucose "	1·01	2·27
" solids "	4·12	2·39
Polarization of juice.......................	......	10·86
Per cent. of available sugar............	6·17	7·06
Number of analyses.......................	118	28

The above results are the average from nine varieties of maize. There were also seven analyses of the juices of maize-stalks after the ears had been removed for the purpose of canning. These stalks were of that variety of maize known as sweet or sugar corn, and the average of available sugar was 6·38 per cent. of the juice.

The methods used in the extraction of the juice and in its manufacture into syrup, and the separation of sugar, are in all respects identical with those employed in the production of syrup and sugar from sugar-cane and sorghum. (P. C.)

See under their several headings: **COTTON, CROP REPORTS, FLAX, FORAGE CROPS, FRUITS, HEMP, HOPS, HORTICULTURE, INDIGO, JUTE, RICE, SUGAR, SUGAR-BEET, VITICULTURE.**

CHAPTER VI.

THE SIGNAL SERVICE IN RELATION TO AGRICULTURE.

The meteorological division of the United States Signal Service was established in 1870 by a joint resolution of Congress, which provided for the giving of warnings to stations on the lakes and the seaboard of the approach and force of storms. By act approved June 10, 1872, the Signal Service was charged with the duty of providing such stations, signals, and reports as might be found necessary for extending the benefits of its research to the agricultural equally with the commercial community. The execution of this law was at first attended with difficulties: the means for reaching the interior proved precarious, as the methods of communication were new to the telegraph companies, which doubted their capacity to carry on the work required of them. All obstacles were, however, overcome, and from June 10, 1872, much of the energy of the Signal Service was directed to serving the interests of the agriculturist.

On the 29th August, 1872, the publication of the *Weekly Chronicle* was commenced. Its object was to give a general summary of the meteorological conditions of the country for comparison with agricultural and other statistics, and generally to furnish information to those who wished to profit by the labors of the bureau, working with its enlarged facilities secured by the act of June 10, 1872. Almost simultaneously with the publication of the *Weekly Chronicle* was issued the *Farmer's Bulletin*, intended expressly to serve the interests of agriculturists.

Subsequently, the *Weekly Chronicle* was discontinued, and was succeeded by the *Monthly Weather Review*, which is still the standard publication of the bureau. Originally, this was intended to present a general view of meteorological facts, particularly those showing the progress of storms during the month; but in 1874 the scope of the Signal Service and its *Review* was greatly increased by the transfer to that service of over 500 volunteer observers who had hitherto been reporting to the Smithsonian Institution, and of over 100 army post-surgeons who had been reporting to the surgeon-general. The amount of data thereby accumulated, particularly that which is of interest to an intelligent agriculturist, is great and concisely summarized. This publication is filled to a great extent with a mass of minute details on such subjects as the flowering and ripening of plants and grains, with facts attending the appearance of frosts, rains, floods, tornadoes, etc., within the field of observation, which in 1874, due to causes mentioned, covered quite thickly that part of the United States east of the Rocky Mountains and, though with fewer stations, the territory west of that range. All atmospheric phenomena, whether taken cognizance of by the instruments or the senses of the observer, are faithfully collated and sent out from the office to those whose interest such information would serve: prominent among those who have drawn on this storehouse of meteorological knowledge have been agriculturists and agricultural institutions. Nor is the *Review* intended for the learned and scientific alone. The results of investigations and observations are spread out in graphic weather-charts within the easy comprehension of the unscientific portion of the community. This periodical is, in fact, so well adapted to those interested in meteorology, both in subject-matter and style, that it has served as a model which several nations of continental Europe have copied for similar publications.

To meet the needs of agriculturists in a particular manner the bureau has, since 1872, published the *Farmer's Bulletin* before mentioned, the name indicating precisely the object for which it is issued. It contains the indications of the weather for the district in which the station printing it is located. These indications, telegraphed from the Washington (D. C.) office at 1 A. M., foretell the weather for the next succeeding twenty-four or forty-eight hours, reaching the rural population, for whose benefit they are telegraphed, from twelve to forty hours before the time they cover expires.

Accompanying the indications for the particular district is a bulletin giving all facts of importance connected with the conditions of the atmosphere of the whole country considered as one mass, viewed at one and the same time in all the parts thereof. The general laws accompanying weather-changes in the United States are set forth in clear yet simple language; the directions of winds that observations have characterized as wet and dry for that geographical district are also given. In a word, there is compressed into the *Farmer's Bulletin* a great deal of meteorological information that is of interest and use to every thinking agriculturist before whom it is placed.

The reports to make up the information thus given out to the farmer come from Sydney, in Cape Breton Island; Roseburg, in Southern Oregon; San Diego, California; and Havana, Cuba, as well as from 150 intermediate stations. This area is 3000 miles long and 2000 miles wide. By the telegraphic system of the bureau, observations, first placed in cipher to condense them into the smallest number of words, begin, within fifteen minutes of the time they are taken, to converge, by various paths, upon the central office in Washington. When the wires work well, an hour sees the last report in, and this time may be shortened or lengthened, depending on the telegraphic service. They are translated as fast as received at the central office. The mass of data, systematically arranged, is placed before an assistant to the chief signal officer, whose duty it is to deduce therefrom forecasts of the weather. This duty is completed at about 12·45 A. M. Then commences the dissemination of the indications and special bulletins to the principal cities and the rural printing-stations, where, between 3 and 4 A. M., the *Farmer's Bulletins* are found printed, addressed, and at the post-office ready for distribution.

As a means for distributing the meteorological data of the bureau to those thinking agriculturists who desire it, and who cannot profit by the *Farmer's Bulletin* because of the isolation of the farm or for other reasons, the publications before mentioned and many others are placed within easy reach of all for a sum in each instance equal to the cost-price to the Government of the material used in printing them.

The task of watching, recording, and giving timely warnings by wire of the rise and fall of rivers was early in its history undertaken by the Signal Service. Stations were established, with gauges to mark the fluctuations of the waters, on the Savannah, Tennessee, Ohio, Mississippi, Missouri, Columbia, Willamette, Sacramento, and other rivers, the valleys of which embrace interests, agricultural or otherwise, influenced by the rise or fall of their waters.

An elaborate scheme of river-flood warnings is now being matured by the chief signal officer. It will embrace, when perfected, all rivers of primary and secondary importance to the agricultural and manufacturing communities contiguous thereto. The plan is very simple, and consists in having observers selected at points on the streams, each observer with a rain-gauge and a river-gauge, and whose business it is to record during stated periods of each year the amount of precipitation, either rain or snow, together with the mutations of the waters in the river-channel. When the amount of precipitation or the rise of the river gives cause to apprehend that a flood will ensue, the observers telegraph the results of their observations to those below, giving such additional information in a brief despatch as may be proper under the circumstances. Those receiving this information bulletin it, publish it in the newspapers, and by every available means give it publicity. The work of the observers, and the rules for telegraphing, are carried out under the orders of the signal bureau. All expenses for the hire of observers, the manufacture of rain-gauges, the construction and maintenance of river-gauges, are borne by the bureau, except in those instances where communities directly benefited voluntarily sustain the expenses of the scheme at their particular locality.

Great benefits are anticipated from this scheme of river-flood warnings. Impossibilities are not expected from it; for instance, no system of warnings can prevent great losses when rivers overflow; but if those who have movable articles which will be injured by water can know that a flood is coming, they can perhaps remove them to a place of safety, thus saving in property rescued large sums of money.

For some years attempts were made to furnish the people of Texas warnings of the approach of "northers," which, if their effects be not anticipated, sweep with such disastrous results over that and the country adjacent thereto on the north. During the summer of 1881 a cordon of reporting-stations was completed on the north and west sides of a portion of the territory visited by these storms, and a systematic plan for giving notice of their approach was begun for the benefit of Southern Nebraska, Kansas, the Indian Territory, and Texas. This plan consists in sending notifications of the approach of "northers" to certain telegraph-centres on the railroads traversing those districts. From these telegraphic-centres the railroads order the notifications to be distributed to the stations on their respective lines.

Notifications similar to those sent to the railroad-centres are also furnished the officer in charge of the military telegraph line, San Antonio, Texas, and sent by him to all stations under his control. As these warnings can generally arrive at least twelve hours before the onset of the storm, agriculturists, ranchmen, and others who are so situated as to receive notice of their approach are enabled in greater or less degree to provide against their effects.

The best proof, probably, of the utility of this system of "norther" warnings that the service could desire it has had in abundance. Every railroad-station in that section desires the information thereby conveyed, and with all classes the scheme is very popular. It is the intention of the chief signal officer, as his facilities are increased, to still further amplify and perfect the system. To render it more generally useful it has been proposed to hoist storm-flags on the trains and at the stations, so those adjacent to the road or near the station can, equally with the railroad-people, be benefited by the information that a "norther" is approaching.

In 1877 the bureau was invited to co-operate with the United States entomological commission in collecting and summarizing all obtainable data relating to the origin, habits, flight, and devastations of the grasshoppers or locusts in some Western sections. All stations of the Signal Service west of the 93d meridian and east of the Rocky Mountains were directed from March until November to report "the date of appearance of the locusts, the direction from which they came, the direction and velocity of the wind, and the state of the weather at the time of observation, etc.," and generally all information which, when systematically arranged and studied, will aid the entomologist to foretell with more or less certainty the undue and periodical return of noxious insects, and particularly the Western locusts. It is now one of the regular duties of observers of the service in the territory afflicted by this scourge to make report of all facts connected with these insects of which they may become cognizant. Much of the data given to the public in the report of the entomological commission was furnished by observers of the Signal Service, and an important contribution to the subject of the hatching of locusts' eggs, based on the temperature observations of that service, has been made by one of the assistants to the chief signal officer.

In 1879 a system of frost-warnings for the benefit of the sugar industries of Louisiana was commenced. It consists in transmitting from the Washington (D. C.) office to the sergeant at New Orleans notifications of such cold waves as will probably extend over the sugar-cane section carrying with them reductions of temperature sufficient to cause killing frosts. The sergeant spreads the information, at the expense of the bureau, through the press and by telegraph to those interested in this branch of agriculture.

Of so much importance were these warnings considered that on Nov. 9, 1881, Gov. McEnery of Louisiana addressed a letter to the chief signal officer requesting that they be renewed again that fall, because of their great value to the agriculturist; which request was complied with: in fact, these frost-warnings have become a permanent feature of the Signal Service.

A service similar in all respects to this, but for the benefit of the orange-growers of Florida, was initiated in the fall of 1881. Notifications were sent to the sergeant at Jacksonville, who, when directed to do so, informed the telegraph-operator at Sanford. From each of these points as centres the information is distributed, at the expense of the bureau, to all those interested in orange-growing who can be reached by newspaper or the telegraph. The warnings are sent whenever a temperature of 40° Fahr. or less is threatened at any time from Nov. 15 to Feb. 1, and as a rule arrive from twenty to thirty hours in advance of the cold wave.

During the year 1881 a system of reports of considerable magnitude was instituted for the benefit of cotton interests in the South. Ninety-five stations furnished readings of maximum and minimum thermometers and of rain-gauges. The stations of observation were distributed pretty evenly over the cotton-belt, at least as much so as was practicable. The railroad and telegraph agents, with the consent of their employers, acted as observers. The cotton-belt was divided into thirteen districts, each with its centre for the collecting of reports; these centres were located at cities where there are Signal Service observers; this precaution being necessary because of the duty of consolidating and disseminating the reports devolving on these centres. The thirteen districts were formed into three divisions, each with its centre, to still further facilitate operations. Observations were taken at 6 P. M., local time, put into cipher, and transmitted to the centre of the district in which the station was located. Here a mean of the maximum, a mean of the minimum temperatures, and a mean of the rainfall for the district is made up and sent to the main centres of the respective divisions. The main centres, Atlanta, New Orleans, and Memphis, interchanged reports, and then distributed them to the centres of districts. By this interchange of reports all the prominent cities of the South were supplied with information daily as to the temperatures and rainfall in the cotton-belt. Published in newspapers, bulletined at cotton exchanges and other prominent places where business-men assemble, these data came quickly under the eye of thinking interested men of the community at these centres or within the scope of their daily newspaper circulation.

On April 1, 1882, this service was renewed, to be continued until Oct. 31 of the same year. The number of stations was increased to 145; the reports, taken at 5 P. M., local time, are sent at 11 P. M., regular circuit hour of the Signal Service, over the telegraphic circuits, and thus reach a larger number of cities than before, including Washington, Louisville, New York, and others. The railroad and telegraph agents who take the observations receive twenty-five cents for each one properly taken and promptly forwarded. The expenses of telegraphing from the centres are borne by the bureau. At Washington the data derived from this scheme are carefully tabulated, and will in a few years furnish valuable information concerning the temperature and rainfall in the various districts of the cotton-belt, each distinct from the rest, and which will be of more value to the agriculturist than to any other member of the community, for it will enable him to see where certain crops can, and where they cannot, be grown to advantage.

There is now (July, 1882) being carried on the preliminary work looking to the establishment of a system for warning tobacco-growers of the approach of cold waves such as will endanger that important crop. The plan in brief is this: On the appearance of danger of the nature indicated the central office at Washington notifies some central telegraph-station on each one of the railroads traversing the country threatened. From thence the notifications are sent to every telegraph-station at which there is an instrument and operator within the limits of the tobacco-growing section. The principle of distribution is the same as in the "norther" scheme. The work involved to meet the needs of tobacco-growers is immense. The total number of telegraph-stations to which warnings will be sent is upward of 1200. They cover territory in the States of Ohio, Indiana, Wisconsin, Kentucky, Tennessee, Virginia, Maryland, Pennsylvania, Missouri, North Carolina, Massachusetts, and Connecticut. The tobacco-growing sections of each of these States have been carefully marked out from data collected by the census bureau; every county in which the crop exceeds to any extent the home consumption is embraced in the frost-warning scheme. More than this the service could not do: to have embraced every county in which tobacco is grown would have far surpassed the resources at the command of the chief signal officer.

With a view to rendering the Signal Service more valuable to the agriculturists of the country, regardless of sectional limits, the chief signal officer has proposed to the governors of the several States the organization of State weather-services, to be organized by authority of their legislatures and to co-operate with the Signal Service in the collection of meteorological data. From this system of reports the bureau will be enabled to determine more fully the minute local peculiarities of climate for each section, and the Agricultural Department will be able to furnish the farmer with information bearing upon the culture of crops particularly adapted to each section.

In the organization of the State weather-services it is proposed to have at least one observer in each county, who will report, by mail, at the close of each month to the chief of the State weather-service: from these data a monthly review of the weather will be prepared by the chief of the State weather-service. Copies of the review will be furnished to each county paper for publication and to each observer. The results obtained from the local weather-services will be furnished to the chief signal officer of the army in time to be made use of in the preparation of the *Monthly Weather Review* of the Signal Service, and they will also be accessible to the Commissioner of Agriculture. (W. E. B.)

CHAPTER VII.

Agricultural Experiment Stations.

For the origin of the agricultural experiment station we should go back at least as far as the year 1843, when Mr. J. B. Lawes of England, recently presented by the queen with a baronetcy for his services to agriculture, associated with himself the chemist, Dr. J. H. Gilbert, for the systematic pursuit of agricultural investigation in the field and the laboratory on his estate at Rothamsted. The work has been carried on there with unflagging zeal up to the present time, supported entirely by Mr. Lawes, and its permanent continuance is ensured by his endowment of £100,000, together with a sufficient area of land. In 1851 the first German station was founded in Moeckern, Saxony, with Emil Wolff at its head, a man now no less famous than Mr. Lawes or Dr. Gilbert as an agricultural investigator. From a special volume of *Die Landwirthschaftlichen Versuchs-Stationen*, issued in 1877 on the occasion of the celebration of the twenty-fifth aniversary of this station, we learn that 134 stations had been opened up to that time, of which 12 had ceased to exist. According to statements received from about half this number, their average income was about 10,000 marks ($2500) per annum, with a range from 1500 to 43,800 marks. This income was derived mostly from the state and from receipts for professional work, such as the analysis of fertilizers, soils, waters, etc. A portion was contributed in some cases by private individuals.

The management of the affairs of these stations is vested generally in boards of control appointed for the purpose, sometimes in a committee of an agricultural society, or in certain officers of the state or of an agricultural school with which the station may be associated. The work of the station is conducted by or under the immediate direction of men who have had scientific training, usually as chemists. This work covers the whole field of agriculture, including certain associated technical processes, such as the manufacture of dairy products, sugar, wine, or beer. Each station, however, concentrates its efforts in one or more directions. Of the whole number in active operation in 1877, while 54 included the inspection of commercial fertilizers within the scope of their work, 43 the inspection of seeds, and 38 of concentrated fodders, only 24 included experimentation with various methods of culture and of manuring, only 9 forestry, 11 dairying, 11 the diseases of plants, 16 the investigation of soils, 5 silk-culture, 13 the production of wine, 1 olive-culture, and so on. Of the special volume of the organ of the experiment stations above referred to, 150 pages are occupied with a list of the titles of the papers on agricultural investigations, over 2000 in number, that had originated there prior to 1877. At the present time there are in active operation probably not less than 160 of these stations in Europe.

To Connecticut belongs the honor of the establishment of the first agricultural experiment station in this country, by the legislative appropriation in 1875 of $2800 per annum for two years, to which $1000 was added by Orange Judd, together with, by the trustees of Wesleyan University at Middletown, the use of laboratories and other facilities for carrying on the work. The inspection of commercial fertilizers, after the manner of the "fertilizer control" of the German stations, was the first important work of this station; and 38 firms signed an agreement binding themselves to guarantee certain specified minimum percentages of the important plant-nutrients contained in the fertilizers offered for sale by them, subject to verification by the station, and to permit inspection of their commodities at all times by the officers of the station. The necessity of such inspection had been brought to the attention of the farmers of the State, especially by Prof. S. W. Johnson through his analyses and lectures beginning almost twenty years earlier, whereby he exposed the perpetration of some glaring frauds in the trade. The Connecticut experiment station may justly be considered as the outcome of Prof. Johnson's efforts in this direction. The first report of the station was published in 1877; a second one, of 170 pages, was also issued from Middletown after the station was transferred to New Haven, completing the account of the work done there. These reports embrace a large variety of important subjects: besides the results of the fertilizer inspection, there are numerous analyses of articles of fodder and food; results are given of the examination of several kinds of garden-seeds, after the manner of the German seed-control stations; and, finally, of the first year's trial of a large number of field experiments carried out by several farmers on a co-operative plan under the guidance of the director of the station: these experiments have been continued up to the present time. In 1877 the Connecticut station was permanently established by legislative action, and an annual appropriation of $5000 was provided for its support, to which has been added a sum ranging from $130 to $725 per annum from other sources. The management of its affairs was put in the hands of a board of control of eight members, the director of the station being *ex-officio* a member. The station was located in the Sheffield Scientific School at New Haven, and went into operation July 1, 1877. Its working force has consisted of the director and two other chemists, with occasional additional help in the laboratory. Having limited accommodations, little could be undertaken beyond routine analytical work, and it possessed no facilities for glass-house or field experimentation. The most prominent feature of its work up to the present time has been the analysis of commercial fertilizers sold in the State, of which 650 samples were examined; besides, 127 samples of feeding-stuffs were analyzed and 105 samples of seeds were tested. The results of this work have been made public as fast as obtained in special bulletins, and are brought together in the annual reports. These reports, of which there are now (Sept., 1882) five, contain, however, much valuable matter besides, such as essays relating to the physical properties of soils, feeding-rations, and methods of analysis of fertilizers and feeding-stuffs; a valuable table of all the analyses thus far made at the station or elsewhere of North American fodder and feeding-stuffs is given; a "manual of cattle-feeding" by one of the chemists of the station for five years should justly be credited to the station as a part of its contribution to agricultural progress. The station now has quarters of its own in the city, with a working force of three chemists besides the director; its annual income from the State treasury is $8000, and the value of its property is about $25,000; its means of investigation, in possession or very soon to be acquired, are six acres of ground, ample laboratory accommodations, a glass-house, and other buildings.

The North Carolina experiment station was established, next in chronological order, in 1877, by the State department of agriculture, under authority from the legislature, and located at Chapel Hill. It is supported by appropriations made by this department out of its income from the license tax paid by manufacturers of fertilizers who sell in the State; the average annual amount appropriated to the station in the first three years of its existence was $4781. The management of its affairs is vested in the department of agriculture; its working force has consisted up to the present time of the director and three or four assistant chemists. Besides its proper agricultural work, it is required also to analyze minerals, ores, and mineral waters for the State geologist and drinking-waters and articles of food for the State board of health. Besides numerous bulletins, three annual reports have been published, comprising over 500 pages, and giving the results of over 1600 examinations of fertilizers, feeding-stuffs, marls, waters, seeds, etc.; much useful information is also given on various agricultural topics in answer to or suggested by questions from farmers of the State. In 1881 the station was moved to a well-furnished laboratory in the building of the department of agriculture at Raleigh. Its annual expenses now amount to about $5600.

The New Jersey experiment station was established in March, 1880, by act of the legislature, with an annual appropriation of $5000. Its affairs are managed by a board of control of seventeen members, of whom one is the director of the station; it is located at New Brunswick in connection with the agricultural college; its publications consist of frequent bulletins giving an account of the work as it progresses, and annual reports, of which two have been thus far published (Sept., 1882). The analysis of commercial fertilizers constitutes a prominent part of the work, but besides there are analyses of feeding-stuffs, of the milk of different breeds of cattle, etc. In the second report the first analyses of ensilage made in this country are given, and also the results of feeding experiments with milch cows and ensilage; field trials with sorghum for the production of sugar and with fertilizers on Indian corn are also reported. Like the Connecticut station, this one has been at liberty to direct all its efforts in the line of agricultural inquiry, and the possession of facilities for field and feeding experiments has given it an advantage over either of the other stations named.

The Cornell University station was established in February, 1879, with a board of control consisting of the faculty of agriculture of the university and the presidents of the prominent agricultural societies of the State. For the first year only a small sum of money was at its disposal for printing its report, and so much of the university appropriation for the farm as could be diverted in this direction; chemical and other work was voluntarily furnished by members of the university; one report has been published, containing a series of papers on various subjects, embracing investigations on the products of the dairy, field experiments with crops and modes of culture and manuring, diseases of animals, insect enemies, etc. Since 1880–81 the station has received $1000 a year from the university, besides which it has the use of ample field and garden grounds and chemical, botanical, entomological, and anatomical laboratories, and farm-buildings and live-stock. The board of control consists at present essentially of the agricultural faculty of the university only.

The legislature of New York passed an act in June, 1880, for the establishment of a State experiment station, and appropriated $20,000 a year for two years for its support. A further appropriation was made in 1882 for the purchase of a farm and buildings in Geneva for the location of the station. The management of its affairs is vested in a board of control of nine members appointed by the governor, the governor being also an additional member *ex-officio*. The director of the station is aided by an assistant director, a chemist, and a horticulturist; the means of investigation at this time (Sept., 1882) consist of the farm of 125 acres and a well-furnished chemical laboratory, but the equipment is not yet completed. The present value of the property of the station is about $35,000.

The legislature of Massachusetts passed an act at its last session appropriating $8000 for the equipment and first year's work of a State experiment station, and $5000 per annum thereafter. The station is to be located at the agricultural college at Amherst, but its affairs are to be managed by a board of control independent of the college; its organization is not yet completed.

The Ohio experiment station was organized in April, 1882, with an appropriation of $3000 from the legislature; its board of control consists of five members, of whom the director is one. It is located at the State University at Columbus, and has the use of the laboratories, farm, and other property of the university; no publications have yet been issued.

In this connection mention should be made of the setting apart of a portion of Houghton Farm in Mountainville, N. Y., by its owner, L. Valentine, for the purposes of agricultural experimentation; a director of the experiments was appointed in 1879. At the present writing the working force of the station consists of a manager, a botanist and chemist, and three assistants in various departments; the annual expenses, about $6000, are met by Mr. Valentine. The means of investigation comprise experimental grounds to the extent of 100 acres if needed, a botanical and chemical laboratory, glass-house and special feeding-stalls, and live-stock. One report has been issued, giving the results of experiments on the growth of Indian corn under varying different conditions, particularly as to manuring.

The investigations conducted at the Bussey Institute, a part of Harvard University, should also be mentioned: the eight bulletins issued from 1874 to 1878, comprising in all over 700 pages, form quite as valuable a contribution to the original investigation of agricultural questions as has yet been made in this country by any experiment station. It is a misfortune to agriculture that the work has been discontinued for want of funds.

It was only natural that the agricultural colleges established with the aid of the Congressional grant of public lands, made in 1862, should endeavor to win the interest and goodwill of the agricultural community by engaging, so far as their means and facilities would permit, in agricultural experimentation. In some cases quite considerable sums have been devoted to this object by the colleges, and in other instances liberal appropriations have been added by the State. Thus supported, and with the free use of ample grounds from the college farms for field experiments, experimental orchards, and forestry plantations, of farm-buildings and live-stock, of glass propagating-houses, and of chemical and other laboratories, the professors of agriculture and of chemistry especially, and sometimes of botany and horticulture also, have been enabled to make many and valuable contributions to agricultural science. The results of this work have usually been made public in the annual reports of the State boards of agriculture of the respective States, but sometimes in special reports of the colleges.

At the California Agricultural College experimental work has been carried on for six years, at a cost of about $2600 per annum; of this, $2000 is given by the legislature, and the rest is appropriated by the University of California, of which the college is a part. The Iowa Agricultural College receives annually $3000 for agricultural experimentation, of which half comes from the State treasury and half from the funds of the college: the State appropriation began in 1882, but experimental work has been carried on there for sixteen years. An experimental creamery and sorghum-works constitute a part of its facilities for experiment. Experiments in agriculture have been carried on at the Kansas Agricultural College for twelve years, with funds supplied almost entirely by the college. At the Maine Agricultural College experiments in stock-feeding and crop-culture have been carried on for thirteen years; only $100 per annum is appropriated directly from the college funds for this purpose, but much more than this is stated to be actually expended for experiments.

At the Massachusetts Agricultural College the inspection of fertilizers has been carried on for ten years, besides other laboratory and field work, but no special appropriations of college funds have been made for the purpose. Twenty-five papers on original work have been published up to this time (Sept., 1882), besides the reports on the fertilizer inspection. At the Michigan Agricultural College experimental work has been carried on for fifteen years, and all prominent branches of agriculture have been covered by it. In the last two years not less than $3000 is stated to have been expended in this direction out of the funds of the college. In New Hampshire important feeding experiments especially have been carried on for six years by the superintendent of the college farm, with assistance from the college funds to the extent of about $450 per annum. In Pennsylvania field experimentation and some laboratory work have been carried on for about fifteen years in connection with the agricultural college. There are three experimental farms—one at the college, and one in the eastern and one in the western part of the State—for all of which an annual appropriation of $2000 has been made. In Tennessee agricultural experiments have been conducted for three years past at a cost to the University of Tennessee of about $1000 per annum, and they have been so favorably received as to induce the trustees of the university to establish an experiment station there. At the South Carolina College agricultural experimentation with liberal means has recently been commenced by the same professor who introduced it with such success at the Tennessee college.

At the State agricultural colleges of Colorado, Illinois, Missouri, Mississippi, and Wisconsin especially, the professors of agriculture and other departments also devote a share of their time and such means and facilities as they can command to the investigation of agricultural questions that specially interest the several sections of country where they are located, and by their contributions of the results of these investigations enrich the annual reports of the State boards of agriculture.

Summing up our history of the subject, it is shown that the scientific investigation of questions pertaining to the agriculture of this country is systematically prosecuted in not less than twenty of the States of the Union; that in these States there are nine regularly organized experiment stations; and that an aggregate sum of not less than $66,000 per annum is expended in fifteen of these States, from which responses have been received to the writer's inquiry, for this experimental work. It is safe to say that the total sum expended, including all the States in which it is known that agricultural experimentation is conducted at experiment stations or agricultural colleges, is not less than $70,000 a year, to be set against about $127,000 expended at fifty-one of the experiment stations in Europe in 1876. All this expenditure and effort in behalf of agricultural progress may fairly be credited to the Congressional act of 1862 for the encouragement of agricultural and mechanical education in the several States; for where the agricultural college itself is not spending this money or making this effort, it is in nearly all cases, if not in all, the parent, and often besides the main support, of the experiment station that is doing the work. (G. C. C.)

CHAPTER VIII.

Birds in Relation to Agriculture.

The agricultural relations of birds are chiefly dependent on those of insects, since it is by the destruction of insects that birds render their principal service to husbandry. When one considers the character and extent of these services, however, several complications arise. Since birds destroy both beneficial and injurious insects, as well as those of neutral interest, a complete understanding of their function is impossible without a knowledge of the kinds of each eaten and of the ratios of each important kind, together with a knowledge of the relative values of these injurious and beneficial insects themselves; and after a balance has been struck of the merits and demerits of birds as destroyers of insects, account must further be taken of the fact that many species are to some extent directly injurious to the husbandman by an appropriation of the fruits of his labors. A careful study of the extent and importance of these injuries must therefore be made, and they must be brought into comparison with the facts derived from the entomological relation, before we can form any exact idea of the effect of any species of bird, or of birds in general, upon the pursuits of the farm and garden. Difficult as the subject thus becomes, it is still further complicated by the fact that the habits of birds and the general character of their food may vary materially according to surrounding conditions, so that birds which are, or seem, beneficial or injurious under ordinary circumstances may prove quite the reverse under other and extraordinary circumstances; and this variation may be sufficient to change completely one's opinion of their final relations to agriculture and horticulture.

To learn by any form of observation and a generalization of its results the economical value of any species, taking into account all seasons of the year, the entire life of the individual, all the parts of its range, and the various irregular changes in its environment—such as the superabundance or unusual scarcity in any season of important elements of its food—is certainly a very difficult undertaking, and has perhaps never been thoroughly accomplished for any bird. Fortunately, however, something less than a complete knowledge of the subject is often decisive of the main question at issue; and, still more fortunately, an intelligent discussion of one function which birds undoubtedly perform in the general economy of organic nature will lead clearly by deduction to some important conclusions the inductive evidence of which it would be almost impossible to obtain. Such a general discussion of the subject may properly precede a description of the food of the most important species as determined by a study of the contents of the stomach.

It is a notorious fact that the especially injurious insects are those whose numbers fluctuate widely from season to season and from year to year, while those of relatively constant numbers do comparatively little harm. The reason of this is not far to seek. It is one of the necessary conditions to the continued existence of any plant that it should have become adjusted to all steady and established drains upon its vitality. Whatever the losses from plant or insect enemies to which it is subject, it must have acquired the ability to furnish a surplus of substance to meet these losses, or perish; and the fact that it does not perish is sufficient evidence that this ability has been acquired. The uniform and continuous depredations of insects are not injurious to vegetation in the primitive order of nature, because they take effect only on those surplus structures or energies of the plant which will be produced at any rate, whether abstracted or not. It should be noted, however, that these depredations may become to some extent injurious to agriculture, since the word *surplus* has a narrower meaning in the vocabulary of husbandry than that in which it is used above. The original system of nature is adjusted merely to the preservation of the species, and all beyond what is necessary to the production of a new individual to take the place of each which perishes is surplusage, intended as a propitiation to enemies or a reward to friends. But in the artificial system of agriculture nothing is surplus which is necessary to the preservation of the species or which is capable of ministering to the wants of man; and insects which are entirely harmless under the former régime may thus become injurious under the latter.

Nevertheless, the injuries to vegetation due to the relatively stable species of insects—those whose average numbers are tolerably abundant—can never approach those of the widely oscillating ones—those whose numbers vary greatly from one year to another. If the depredations of the latter go to the extent of diminishing temporarily the area occupied by the species of plants attacked by them, the space so abandoned will usually, in a state of nature, be invaded by some competitor for foothold, and recovered again slowly and with difficulty or not at all, so that the average surface held by the plant will be decreased. Such excessive and unusual injuries are still more obnoxious to agriculture than to uncultivated vegetation, since they may completely devastate the limited area of a farm or garden, and bring ruin on the individual proprietor, without reducing materially the average area of the species of plants affected.

Now, a species is stable when its rate of increase and the losses to which it is subject are uniform and constant and balance each other, or when they vary together if they vary at all; and it oscillates when this balance of increase and expenditure is in any way disturbed. Since the multiplication of organisms is governed by the laws of geometrical progression, it requires but a slight increase of the reproductive rate, or a slight diminution of the checks upon multiplication, to convert a harmless insect into a pest. Anything, therefore, which tends to change a species of relatively uniform numbers into a widely fluctuating one is peculiarly dangerous and harmful; while those checks upon multiplication which maintain a steady pressure upon the stable species, and those which tend to restrain rising oscillations or to reduce to order those already fully developed, are of the highest value; and as the number of insects capable of great harm if sufficiently abundant, but kept within the limits of harmlessness by checks upon their increase, is many times as great as that of the species which occasionally escape these limits, the maintenance of existing checks is very much more important than the establishment of new ones.

Now, it has been clearly demonstrated that insectivorous birds in general belong in one or both of these highly valuable classes. Under ordinary circumstances and uniform conditions their food varies but little from year to year, and each species is found to have its more or less peculiar regimen, thus exercising a steady and continuous pressure upon the kinds of insects which it prefers; but when any insect becomes superabundant, it is the general rule that a number of kinds of birds depart from their more customary habits so far as to eat unusual quantities of this too numerous species. They thus unquestionably serve to maintain that steady balance between plant- and insect-life which confines the injuries to vegetation within narrow limits, and to restore that balance if in any way disturbed. There is thus established a presumption in favor of the usefulness of every insect-eating species, and the burden of proof lies on those who would controvert this presumption with regard to any bird whatever. To justify the destruction of a species in the interests of agriculture or horticulture, it must be shown that its removal cannot produce injurious disturbances of the natural balance of life, or that the resulting disturbances will be more than compensated by some unquestionable advantage.

The fact that birds eat predaceous insects, as well as phytophagous ones, does not invalidate this argument, since the presumption created is in favor of the established order of nature, whatever that may be. Whoever would recommend the elimination of a bird as a destroyer of beneficial insects has first the difficult task to perform of tracing the disturbances which would thus arise and demonstrating the final value of the consequences.

It is evident, further, that the same reasoning applies to the *introduction* of a species as to the *destruction* of one. Here also the burden of proof rests on those who would interfere with the established order of life, and it must be shown not only that certain benefits will accrue from the proposed innovation, but that no uncompensated disturbances will follow. The conclusions thus reached narrow the field of actual investigation and bring it within much more manageable limits. The principal questions to be solved are now seen to be these:

1. What birds do any direct injury to the farm and garden?
2. Can the elimination of these be accomplished without initiating serious disorders of the general system of the life of the region?
3. Can the natural order be artificially improved by increasing or diminishing the number of some species, or by substituting certain kinds for others?

Considered in this way, probably no one would claim that a case has yet been made out against any native bird, or is likely soon to be; and, on the other hand, neither has the propriety of introducing any exotic species yet been shown.

The space available will only permit a brief account of the food of the more important species, and too little systematic and thorough work has yet been done on many of these to authorize definite and final conclusions.

The thrush and bluebird families (*Turdidæ* and *Saxicolidæ*) include nearly all the commonest garden-birds, and are therefore the most important to horticulture. The robin (*Turdus migratorius*, L.), the catbird (*Mimus Carolinensis*, L.), and the brown thrush (*Harporhynchus rufus*, L.) are the principal thrushes. The family is frugivorous and insectivorous, preferring fruit to insects in midsummer, but depending wholly on the latter in the early part of the year.

The robin feeds almost entirely upon insects from February to May inclusive, but thenceforward these make only about one-third of its food, the remaining two-thirds consisting of fruits, tame and wild. It eats earthworms and insects of all orders, but prefers caterpillars and other larvæ. In the fruit season it destroys considerable quantities of raspberries, blackberries,

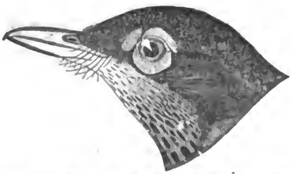


Fig. 1.—Head of Robin (natural size), from Coues.

grapes, and especially cherries. About 10 per cent. of its usual food consists of predaceous insects.

The food of the catbird differs especially from that of the robin by the larger ratios of ants, crane-flies, and berries, and the smaller of larvæ, grapes, and cherries. This bird eats also more spiders and myriapods than the robin. Both are fond of early apples.

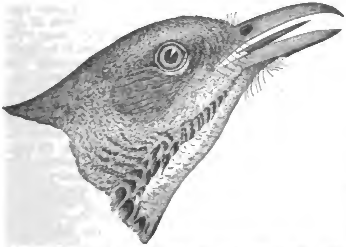


Fig. 2.—Head of Brown Thrush (natural size), from Coues.

The brown thrush finds about one-half its food in early spring in the fragments of corn and other grains and seeds picked from the droppings of animals, the remainder being insects in great variety. Its taste for garden-fruits in summer is a little less decided than that of the robin and catbird, and the ratios of insects are larger at that season. It eats fewer caterpillars than the robin, but destroys many June beetles (*Lachnosterna*).

The bluebird (*Sialia sialis*, L.) is much more strictly insectivorous than the thrushes, and destroys but a trivial quantity of edible fruit. On the other hand, it takes unusual numbers of beneficial insects, which make under ordinary circumstances about one-fifth of its food. The most prominent elements in its dietary are caterpillars (especially the cutworms found in grass), spiders, and grasshoppers. In the number of predaceous beetles eaten it does not differ materially from the thrushes.

The most important member of the wren family (*Troglodytidæ*) is the common house-wren (*Troglodytes domesticus*, Bartr.), a strictly insectivorous bird, which feeds upon the greatest variety of minute insects, both beneficial and injurious.

In the lark family (*Alaudidæ*) occurs the horned lark (*Eremophila alpestris*, L.), an abundant bird in pastures and meadows, in which it lives throughout the year. It is chiefly granivorous, subsisting wholly in winter upon seeds of weeds, especially pigeon-grass (*Setaria*), and fragments of grain gleaned from offal. About one-third of its food throughout the year consists of insects, only one-half of which are caterpillars of species which feed on grass. Spiders, ants, grasshoppers, grubs, and a variety of flies, bugs, and beetles, are also found occasionally.

The titmouse or chickadee (*Parus atricapillus*, L.), belonging to the family *Paridæ*, is essentially a woodland bird. It is chiefly insectivorous, notable for its destruction of insect eggs, but eating also caterpillars, spiders, and a great variety of the smaller insects which occur in its haunts, together with seeds and berries. It is among the small number of birds which feed on plant-lice (*Aphides*).

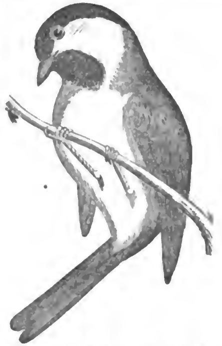


Fig. 3.—Chickadee (nearly natural size), from Coues.

The warbler family (*Sylvicolidæ*) includes chiefly woodland migrants, most of which pass beyond our bounds. The family is almost wholly insectivorous. The Tennessee warbler (*Helminthophaga peregrina*, Wils.) is especially fond of caterpillars and other larvæ, but does some mischief in vineyards during its autumnal migration by breaking the skins of grapes. The summer warbler (*Dendrœca æstiva*, Gm.) is a summer resident, found everywhere in trees. It eats, like the preceding, an unusual number of caterpillars, but complicates its record by destroying also many of the minute *Hymenoptera*, among which the parasitic species are found. The Maryland yellow-throat (*Geothlypis trichas*, L.), another summer resident, scarcely less abundant than the summer warbler, is a terrestrial bird, found most frequently in hedges and shrubbery. It is strictly insectivorous, destroying many moths, caterpillars, and spiders, with but very few predaceous beetles. Another abundant summer resident is the redstart (*Setophaga ruticilla*, L.), a woodland bird of arboreal habit. It is purely insectivorous, and takes much of its food on the wing, eating great numbers of gnats, flies, and moths, together with many Hymenoptera, large and small, but taking also many caterpillars, both smooth and hairy.

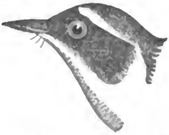


Fig. 4.—Cedar Bird (natural size), from Coues.

The cedar-bird (*Ampelis cedrorum*, V.), of the family *Ampelidæ*, is noted for its ravages in the cherry-orchard, but is wholly insectivorous when fruits are scarce and insects superabundant. It wanders in flocks where food is most plentiful, and a large number have been known to take up their residence in an orchard infested by canker-worms until the pest was completely exterminated.

The great family *Fringillidæ* (finches) has been too little studied in this country to permit more than the most general statements respecting its food. With few exceptions, the species are primarily and principally granivorous, but nevertheless destroy no insignificant number of insects, especially during the breeding season. The yellow-bird (*Chrysomitris tristis*, L.), a very abundant species, lives the year round almost entirely on seeds, chiefly of composite plants. Insect fragments are but rarely found in its food—probably often enough, however, to repay the trifling damage which it does in fields of ripening oats. The chipping sparrow (*Spizella socialis*, Wils.) eats many caterpillars, beetles, and other insects, in addition to great quantities of the seeds of weeds and other vegetable food. This bird is not known to do any injury whatever to the products of the farm and garden.

The English sparrow (*Passer domesticus*, L.) has caused, since its certainly ill-considered introduction, a very great amount of discussion and but little investigation. From the valuable summary of notices of its food and habits since its advent into this country prepared by Dr. Coues, and from the admitted consequences of its introduction into other countries, we must conclude that it does here, and under existing circumstances, more harm than good, and bids fair to set on foot far-reaching and injurious disturbances of the general balance of bird- and insect-life. It is probably most destructive in the vegetable garden and in fields of grain, sometimes becoming in the latter a serious and alarming pest.

The black-throated bunting (*Euspiza Americana*, Gm.), an abundant prairie species, takes about twice as many insects as seeds, including in the latter small quantities of wheat. It is especially notable for the large number of caterpillars and Orthoptera, and for the insignificant number of beetles, eaten. Most of the latter are of the division *Rhyncophora*, which contains many of the worst pests of the orchard. It is a most effective enemy of the canker-worm.

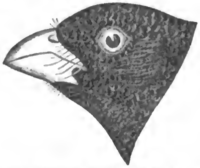


Fig. 5.—Rose-breasted Grosbeak (natural size), from Coues.

The rose-breasted grosbeak (*Goniaphea Ludoviciana*, L.) is noted for a positive appetite for the Colorado potato-beetle. It is worthy of remark that the bird has become much more common in the Mississippi Valley since the advent of this pest. The species is more largely insectivorous than vegetarian, destroying especially very many beetles and caterpillars.

The oriole family (*Icteridæ*) includes some of the most difficult and disputed species; and far too little work has been done upon it to permit definite and positive descriptions of its food. The meadow-lark (*Sturnella magna*, L.) is the only species whose food has been exhaustively studied. About three-fourths consists of insects, the remainder being seeds and grain. This bird is especially remarkable for its destruction of caterpillars and grasshoppers, which together make nearly half its food. It appropriates about the same ratio of predaceous beetles as the thrushes, but eats no fruit whatever.

The cowbird (*Molothrus ater*, Bodd.) feeds principally on the seeds of weeds and on fragments of grain obtained in pastures, but eats also many insects, especially caterpillars. The orioles (*Icterus spurius*, L., and *I. galbula*, L.) are more largely insectivorous than the other members of this family, and are especially fond of caterpillars, which make, in fact, the largest part of the food of the orchard oriole. The Baltimore oriole has a strong liking for fruit, and is especially injurious to grapes. The purple grackle (*Quiscalus purpureus*, Bartr.) is essentially a granivorous bird, eating most freely of corn, wheat, oats, and the small grains generally. In the latter part of the season, however, it destroys great numbers of grasshoppers. It has also the reputation of eating the eggs and young of other birds, but is not known to attack fruit of any kind.

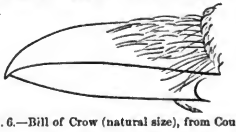


Fig. 6.—Bill of Crow (natural size), from Coues.

The common crow (*Corvus frugivorus*, Bartr., family *Corvidæ*) is perhaps as nearly omnivorous as any bird, and does both harm and good to agriculture. No sufficient study of its food has yet been made to enable any one to strike a fair balance of its account. The same remark applies to the blue jay, although its merciless appetite for the eggs and young of other birds renders the value of its services extremely doubtful. It is sometimes a pest in an orchard of early apples.

The flycatchers (*Tyrannidæ*) are, as their name implies, almost entirely dependent upon insects for food, and usually capture their prey upon the wing. The kingbird (*Tyrannus Carolinensis*, L.) takes an occasional berry, and also eats caterpillars sparingly. It probably sometimes does a little harm by the destruction of bees, but the other members of the family are not injurious except by eating moderate numbers of parasitic Hymenoptera and other beneficial insects.

The cuckoos (*Cuculidæ*) are highly useful birds, and do much to protect the shade trees of towns from the ravages of caterpillars, of which they are the especial enemies.

The services rendered by the woodpeckers (*Picidæ*) in woodlands are well known. The red-headed woodpecker (*Melanerpes erythrocephalus*, L.) is very fond of apples, and also eats many of the large predaceous beetles. The flicker (*Colaptes auratus*) is noted for its preference for ants, which it digs from the ground and from rotten wood.

The raptorial birds (the hawks and owls) are generally reckoned injurious, on account of their destruction of other birds. The smaller species eat many more insects than birds, however, and it is not impossible that the restraining influence of the birds of prey upon the undue multiplication of the smaller species is a benefit rather than an injury. On the other hand, they tend to drive the smaller birds to the immediate vicinity of human habitations, concentrating them in gardens, where they do their principal mischief, and leaving the grain-fields too much unprotected.

The pigeons (*Columbidæ*) are almost wholly granivorous, and the mourning dove (*Zenaidura Carolinensis*, L.) is possibly injurious to some slight extent, as it eats small quantities of grain. The greater part of its food is made up of the seeds of weeds.

Among the grouse and their allies, the quail (*Ortyx Virginianus*, L.) is the only one of especial interest to the farmer. It is both granivorous and insectivorous, eating some corn and wheat, but destroying also many grasshoppers, potato-beetles, and other injurious insects. It is said sometimes to eat the chinch-bug in considerable quantities.

The wading and swimming birds are too rarely either injurious or beneficial to husbandry to deserve especial mention here. (S. A. F.)

CHAPTER IX.

INSECTS IN RELATION TO AGRICULTURE.

In the United States more has perhaps been done toward developing a science of agricultural or economic entomology than in any other country. With the exception of occasional public documents concerning special insects that have attracted attention for the time—as, for instance, the voluminous French publications upon the grape phylloxera, the Russian documents upon *Anisoplia austriaca*, and various South American papers upon locusts, confined for the most part to the Argentine Republic—no Government seems to have given encouragement that will compare even with the scanty support which our general Government and the different States have given to agricultural entomology.

Importance of Economic Entomology.

The losses occasioned by insects injurious to agriculture in the United States are, in the aggregate, enormous, and have been variously estimated at from $300,000,000 to $400,000,000 annually. It will never be possible to fully protect our crops from the ravages of the many species that injuriously affect them; but it should be the aim of the economic entomologist to prevent as much of this loss as possible, and at the very least expense. To do so effectually, the chief knowledge required is of an entomological nature—*i. e.*, the full life-history and habits of the different species; and this implies a great deal of close and accurate work in field and laboratory. By means of it he learns which species are beneficial and which injurious; and the ability to distinguish between friend and foe is of the first importance in coping with the latter, for it is a notorious fact that the farmer frequently does more harm than good by destroying the former in his blind efforts to save his crops.

A great deal has been written and published of late years on the subject of economic entomology, much of it, however. at second hand; for, unfortunately, the original workers are few. That comparatively small progress has hitherto been made is due to this last fact, and to the intricacies and complex nature of the subject. The economic entomologist, to do effectual work, must possess not merely a knowledge of the particular injurious species and its habits with which he wishes to deal, but must study its relations to wild plants, as well as to the particular cultivated crops it affects. He must also study it in its relations to other animals. Indeed, its whole environment must be considered, especially in connection with the farmer's wants, the natural checks that surround it, and the methods of culture that most affect it. The habits of birds; the nature and development of minute parasitic organisms, such as fungi; the bearings of meteorology,—must all be considered; and yet, with the knowledge that a study of all these bearings implies, he will frequently fail of practical results without experiment and mechanical ingenuity. The thorough study indicated should precede experiment, as practical tests without scientific attainment are often useless and misleading; for the larger part of the remedies proposed in our agricultural newspapers are like the quack cures for human ills.

Difficult as the subject would thus appear, gratifying progress has been made in this country of late years, not only in acquiring more exact and complete knowledge of the habits and natural history of many of our worst insect pests, but by the discovery of improved insecticides and the perfecting of mechanical means for applying them.

In order to save repetition in the brief treatment of the insects to be mentioned in this article, it may be here stated that the three most important and valuable materials now in common use as insecticides in the United States are—(1) arsenical compounds; (2) emulsions of petroleum; (3) pyrethrum.

Arsenical Compounds.—Paris green and London purple may be used in suspension in water in the proportion of from ¼ pound to 1 pound of the powder to 40 gallons of water. When mixed with flour or other diluent, the proportion should be 1 part of the poison to 25 or more of the diluent.

2. *Petroleum Emulsions.*—A satisfactory emulsion may be made in the following proportions: kerosene, 1 quart; condensed milk, 12 fluid ounces; diluted with water, 36 ounces. This is emulsified by violent churning, and before use may be diluted with water from 12 to 20 times. Equal parts of kerosene and condensed milk may also be thoroughly mixed or churned together, and then diluted *ad libitum* with water.

3. *Pyrethrum.*—Pyrethrum can be applied—(1) as dry powder; (2) as a fume; (3) as an alcoholic extract, diluted; (4) by simply stirring the powder in water; (5) as a tea or decoction. As a powder it may be mixed with from 10 to 20 times its bulk of wood-ashes or flour, but before use should remain for twenty-four hours with the diluent in an air-tight vessel.

In the limited space allotted for this article only a few of the more important of the insect enemies to agriculture can be considered, and these in the briefest manner. They may be treated of under the general heads of Insects injurious to Fruit and Fruit Trees, to Cereals and Forage-crops, to Garden Vegetables, to Miscellaneous Field-crops (Cotton and Tobacco), to the Vine, and to Live-stock. The subjects of forest-tree insects and of apiculture are not considered here, having each a literature of sufficient importance to warrant special consideration.

Insects injurious to Fruit and Fruit Trees.

THE CODLING MOTH (*Carpocapsa pomonella* L.), see article CODLING MOTH.

THE PLUM CURCULIO (*Conotrachelus nenuphar* Herbst.), see article PLUM CURCULIO.

THE APPLE CURCULIO (*Anthonomus quadrigibbus* Say). This insect differs from the plum curculio in its smaller size, longer snout in the marked broadening of the posterior part of the body, and in the possession of four humps on the wing-covers. Like the plum curculio, it is single-brooded and hibernates in the beetle state. The pupa state is undergone *within* the infested fruit, which seldom falls to the ground. It is a native insect, and naturally feeds on wild crabs and haws. *Remedy:* The only remedy is found in the destruction of the infested fruit, which, while it does not fall of itself, may be jarred to the earth.

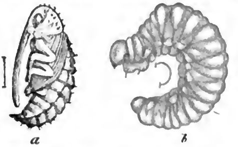


FIG. 1.—*Anthonomus quadrigibbus: a*, pupa; *b*, larva (enlarged).

THE APPLE-MAGGOT, or "RAILROAD-WORM" (*Trypeta pomonella* Walsh). This insect is second only to the codling moth in its injuries to the apple. The maggot is a small, white, footless larva, 5 mm. in length, and bores tunnels through the fruit in all directions. The infested fruit falling in the autumn, the larvæ enter the ground and hibernate as pupæ, the adult flies appearing in the month of June. Early apples are more liable to be infested. *Remedy:* Collect and destroy the infested fruit promptly after its fall from the tree.

THE WHITE-MARKED TUSSOCK-MOTH (*Orgyia leucostigma* Sm. and Abb.). The larvæ of this insect are quite common, and frequently very destructive to the foliage of fruit and shade trees. They hatch in May from the mass of eggs with which the female has plastered her cocoon the previous fall. There are two broods a year, the moths appearing in June and September. The female moth is wingless, while the male is winged. The full-grown caterpillar is very handsome; it is 4 cm. in length, has a coral-red head; is furnished upon the back with four cream-colored brushes, and at either extremity with two long tufts of black hair. *Remedy:* This species is destroyed by nine distinct parasites. The best artificial remedy consists in collecting and destroying the rather conspicuous egg-masses in the winter.

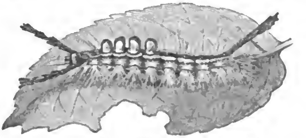


FIG. 2.—*Orgyia leucostigma:* larva (natural size).

THE APPLE-TREE TENT-CATERPILLAR (*Clisiocampa americana* Harr.). The webs of this insect are familiar to all fruit-growers. The caterpillars hatch in the spring from ovoid rings of eggs which are laid upon the trees the previous June by the female moth. The length of the larval life is from five to six weeks, and during this time the caterpillars live in groups under the same web, issuing to feed upon the leaves. Most of the larvæ leave the web to transform, spinning oval yellowish cocoons in fence-corners or elsewhere. The duration of the pupa state is from two to three weeks. The moth expands 4·5 cm., and is dull yellowish or reddish-brown in color. *Remedies:* Prune off and burn the eggs during winter; they are easily noticed. Where the nests are noticed the branch may be sprinkled with Paris-green water or the webs burned by a torch.

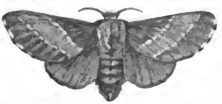


FIG. 3.—*Clisiocampa americana:* female moth (natural size).

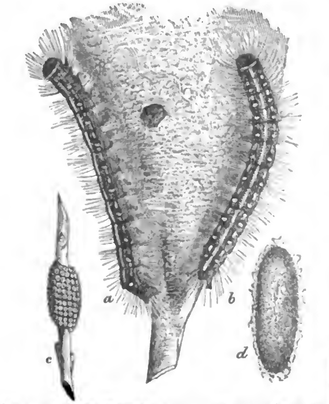


FIG. 4.—*Clisiocampa americana:* a, larva, side view; b, larva, dorsal view: c, eggs, with glue-like covering removed; d, cocoon (natural size).

THE FALL WEB-WORM (*Hyphantria textor* Harr.). These insects, feeding in the fall of the year, are often mistaken for the preceding species, but they have nothing in common except the spinning of a web. The eggs are deposited in clusters upon the surface of the leaves in June, and the larvæ hatch in June, July, or August, and immediately begin to spin in company, defoliating the limbs as they go, and frequently including the whole tree. In the North there is but one brood each year, the insect hibernating in the pupa state, but farther south there are two broods. *Remedy:* Prune or burn the web as soon as it is begun, or sprinkle the branch with Paris-green water, as for the preceding species.

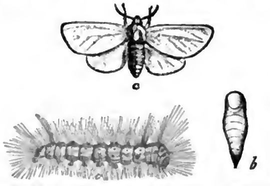


FIG. 5.—*Hyphantria textor:* a, larva; b, pupa; c, moth (natural size).

THE OYSTER-SHELL BARK-LOUSE OF THE APPLE (*Mytilaspis pomicorticis* Riley). This is one of the most prominent of the insects belonging to the very injurious family of *Coccidæ* or bark-lice, and the remarks made upon it will apply in great degree to many of the other injurious species. The full-grown female is degraded and wingless, and is furnished with a long beak, with which she sucks the sap through the bark. She is covered with a scale, shaped like a minute oyster-shell and composed in small part of her cast skins, but in great part of a gray material secreted from her body. The perfect male is an active two-winged insect, but with the mouth-parts replaced by simple eyes or ocelli. In the earlier stages of its growth the male is also covered by a scale similar to that of the female, but smaller. At the North there is but one brood a year of this insect, the young hatching from the eggs which have wintered under the female scale, and spreading to all parts of the tree before settling and commencing the formation of their own scales. In the more southern States there are two generations each year. This species, although particularly injurious to the apple, has been found upon some twenty or more different species of plants. It is destroyed by the Chalcid parasites, *Aphelinus mytilaspidis* (Le Baron), *A. abnormis* (Howard), *A. fuscipennis* (Howard), and *Coccophagus varicornis* (Howard). *Remedies:* The remedies here mentioned are equally applicable to all scale-insects, especially those of the same sub-family (*Diaspinæ*). A kerosene emulsion, made by churning violently together kerosene and milk, may be greatly diluted with water and sprayed over the trees, killing both the wandering young lice and those under the settled scales. This is absolutely the best remedy known. Next in efficacy comes a watery solution of whale-oil soap sprayed over the trees in the same manner. Crude oil of creosote dissolved in strong alkalies makes a very effective wash for the trees. It should be used,

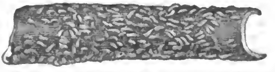


FIG. 6.—*Mytilaspis pomicorticis:* scales on bark of apple-twig (natural size).

however, with great caution, as it is highly injurious to vegetation.

The Round-headed Apple-tree Borer (*Saperda bivittata* Say). This is a native American insect, and attacks many other rosaceous trees besides the apple. The adult is a long-horn beetle, 2 cm. in length, gray in color, marked by two broad white longitudinal stripes. The female lays her eggs during May and June just under the bark near the base of the tree, and the larvæ, hatching, bore through the bark into the sap-wood. They live in the sap-wood for two years, and the third summer, having become about two-thirds grown, they work into the solid wood, finishing their gnawing at the commencement of the third winter. The following spring they transform to pupæ, and in three weeks issue as perfect beetles through round smooth holes. *Remedies:* Keep the base of the tree free from weeds and trash, and apply soap during the month of May. Examine the trees again in the fall and cut out any young larvæ that may have entered the trunks.

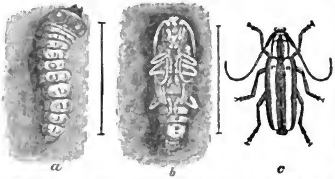


FIG. 7.—*Saperda candida:* *a*, larva; *b*, pupa; *c*, beetle (natural size).

The Flat-headed Apple-tree Borer (*Chrysobothris femorata* Fabr.). This borer is the larva of a flat, metallic Buprestid beetle. It may be distinguished from the round-headed borer by its enlarged and flattened anterior extremity. It bores an oval hole, and lives but one year in the tree. *Remedies:* This borer is attacked by a parasitic Chalcid fly, and the same artificial remedies may be used as for the round-headed borer. The soap must, however, be applied to the larger branches as well as the trunk of the tree, as the insect infests all parts, and is partial to sun-scalded parts or parts that are otherwise injured or diseased.

The Spring Canker-worm (*Paleacrita vernata* Peck). This insect, common throughout the more northern States east of Kansas, is a great pest to fruit and shade trees. It is a span-worm or looper, and is the larva of one of the Geometrid moths. The eggs are laid in the spring in the crevices of the bark, usually in small groups, and the larvæ, hatching, feed upon the leaves through a space of three or four weeks. They then drop to the ground by means of a silken thread, and enter the pupa state in an earthen cell just under the surface. Here they remain (a few moths perhaps rising in the fall) until the following spring. The male moth is full-winged and flies readily, while the female is wingless, and is obliged to climb the tree to deposit her eggs. *Remedies:* A good remedy is found in fall ploughing, which breaks up the pupa-cell and submits the pupa to the action of the cold and wet. The most satisfactory remedy, however, consists in encircling the tree with a bandage or trough so made as to prevent the female from climbing up to deposit her eggs. The most effective and inexpensive trough consists of a square frame of timber laid on the ground around the base of the tree, with a continuous wide groove at the top filled with petroleum. The trough has to be watched constantly, and kept clean and well filled with the oil. The space between the frame and the tree should be filled with packed ashes. Hundreds of devices have been invented and many patented, but to this was awarded the prize of the Essex Agricultural Society.

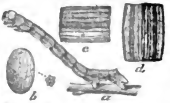


FIG. 8.—*Paleacrita vernata:* *a*, larva (natural size); *b*, egg; *c*, *d*, side and back views of one of the larval joints (enlarged).

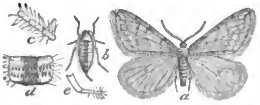


FIG. 9.—*Paleacrita vernata:* *a*, male moth; *b*, female moth (natural size); *c*, antennal joints of female; *d*, an abdominal joint of female, from above; *e*, ovipositor of female (enlarged).

The Fall Canker-worm (*Anisopteryx pometaria* Harris). This species, for a long time confounded with the spring canker-worm, is only found in the East. It differs from the latter not only structurally, but in several important points in its habits. The eggs are laid in patches on smooth surfaces of the bark or limbs, and are much more easily observed and destroyed. The pupa is enclosed in a rather tough, silken cocoon, which renders the remedy of fall ploughing practically useless. A large proportion (if not the majority) of the moths issue in the fall, and the remainder in the spring, so that it hibernates in both the egg and pupa states. *Remedies:* The troughs used for the spring canker-worm are equally effective here, as the female is also wingless; but from the fact that at least half of the eggs are laid in the fall, the troughs must be kept in operation through the months of October to April.

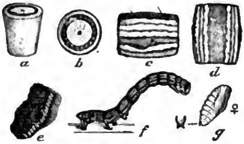


FIG. 10.—*Anisopteryx pometaria:* *e*, egg-mass; *f*, larva; *g*, pupa (natural size); *a*, egg, from side; *b*, egg, from top; *c*, joint of larva, from side; *d*, joint of larva, from top (enlarged).

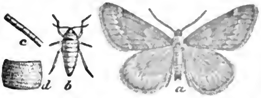


FIG. 11.—*Anisopteryx pometaria:* *a*, male moth; *b*, female moth (natural size); *c*, joints of female antennæ; *d*, a joint of female abdomen (enlarged).

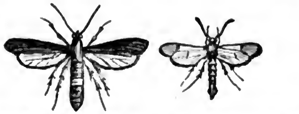


FIG. 12.—*Ægeria exitiosa:* female and male moths (natural size).

The Peach-tree Borer (*Ægeria exitiosa* Say). This is the most destructive enemy to the peach tree. It is the larva of a small clear-winged moth which lays its eggs in the spring upon the bark of the tree near the surface of the ground. The white, fleshy larvæ work in the wood just under the bark at the surface of the ground, or beneath it, or often at some distance above the surface. There is but one generation each year, and it winters in the larva and pupa states. The pupa is formed in a gummy cocoon at the mouth of the burrow. Two species of Chalcid parasites have been bred from these cocoons. *Remedies:* The borers are easily cut out by hand, and the base of the trunk once cleaned, the moths may be prevented from oviposition by heaping a mound of earth around the base or by protecting it with a band of paper. A band of straw or hay placed upright around the foot of the tree is also recommended.

THE CURRANT-STALK BORER (*Ægeria tipuliformis* L.). This is an imported insect, congeneric with the above. It works in the pith of the canes, weakening and destroying them. The remedy lies in the burning of the infested stalks.

THE IMPORTED CURRANT-WORM (*Nematus ventricosus* Klug). This is a European insect, and was introduced into this country in 1857 by way of Canada. The worm is the larva of a Tenthredinid or sawfly, and hatches in spring from eggs laid on the under surface of the leaves. Upon attaining its growth after stripping the leaves, it transforms to pupa in a brownish cocoon upon or just beneath the surface of the ground. A second generation appears in July or August, which winters in the pupa state. The larvæ are green, with shining black spots, and possess twenty legs. It is destroyed by two Ichneumonid parasites. *Remedy:* The most effective remedy is found in the use of white hellebore, either sprinkled upon the bushes or used in a watery solution.

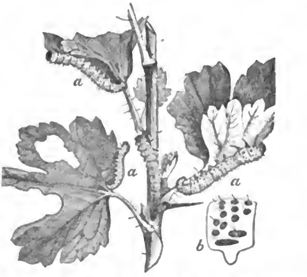


FIG. 13.—*Nematus ventricosus: a, a, a,* larvæ (natural size); *b,* spots on one of the joints (enlarged).

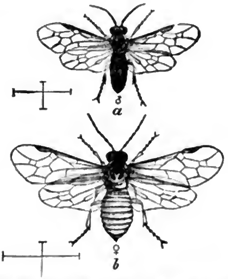


FIG. 14.—*Nematus ventricosus: a,* male; *b,* female fly (enlarged).

THE NATIVE CURRANT-WORM (*Pristiphora grossulariæ* Walsh). This worm is green in color, but differs from the preceding in lacking the black spots. There are two generations a year, the worms appearing in June and July, and again in August and September. It winters in the egg state, the eggs of the second brood being deposited on the twigs instead of the leaves. *Remedy:* The same as for the preceding species.

THE SNOWY TREE-CRICKET (*Œcanthus niveus* Harr.). This insect injures the canes of raspberry and grape, and also the twigs of peach and other trees, by boring and depositing its eggs in them in long rows, thus weakening the canes so that they are easily broken off by the wind. It also cuts off leaves in the summer, occasionally to an alarming extent. *Remedy:* The only remedy consists in pruning the punctured twigs in the winter-time and burning them, thus destroying the eggs within the canes.

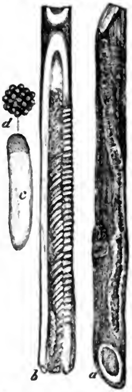


FIG. 15.—*Œcanthus niveus: a,* raspberry-cane punctured by female; *b,* raspberry-cane in section, showing arrangement of eggs (natural size); *c,* an egg enlarged; *d,* tip of same (more enlarged).

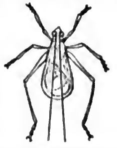


FIG. 16.—*Œcanthus niveus:* male (natural size).

Insects injurious to Cereals and Forage-crops.

THE WHITE GRUB (*Lachnosterna fusca* Froh.). This grub is the larva of the well-known "May-bug" or "June-bug." The beetles fly very abundantly in May and June, pair, and the female enters the ground for a short distance to deposit her eggs. The eggs hatch in three or four weeks, and the young larvæ feed upon the roots of grass, corn, strawberries, or vegetables, often doing great damage in the second year of their growth. In early spring of the third year they trans-

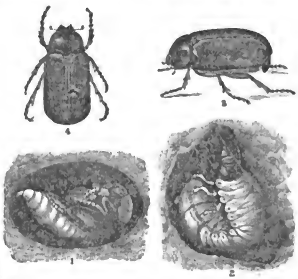


FIG. 17.—*Lachnosterna fusca: 1,* larva; *2,* pupa; *3,* beetle, from side; *4,* beetle, from back (natural size).

form to pupæ in earthen cells, and issue again as perfect beetles in May. The larva is destroyed by a parasitic fungus (*Torrubia ravenelii* Berkely), and by a black wasp (*Tiphia inornata* Say). *Remedies:* Turning hogs into infested fields has been strongly advised. Another good remedy consists in trapping the beetles by attracting them to a light suspended over a tub of water covered with a film of kerosene.

THE CLOVER-SEED MIDGE (*Cecidomyia leguminicola* Lintner). This insect has done much damage for a few years past in New York and south to Virginia. The eggs are laid in early spring in the clover-heads, and the young maggots live each in a seed-capsule, feeding upon the seed. There are two broods a year in New York, and the insect hibernates in the pupa state in a minute oval cocoon just under the surface of the ground. A large percentage of the maggots is destroyed by the Chalcid parasite, *Eurytoma funebris* Howard. *Remedy:* The most efficient remedy will probably be found in cutting the clover for the hay-crop the first week in June for two successive years, care being also taken to cut the clover in the fence-corners and out-of-the-way places at the same time. This date applies only to New York State.

THE JOINT-WORM (*Isosoma hordei* Harr.). In years past the joint-worm has done much damage to the wheat, oats, rye, and barley crops of the more Northern and Eastern States. It belongs to the only plant-feeding genus of the parasitic family *Chalcididæ*. The eggs are laid near the base of the stalks of grain in the latter part of May or the first of June. The young larvæ form slight gall-like swellings of the stalks, in which they feed, dwarfing the stalk and reducing the yield. Most of the larvæ winter in the stalks, but a few transform and appear as flies in late fall. They are destroyed by the Chalcid parasite, *Semiotellus chalcidiphagus* Walsh. *Remedy:* It is obvious that burning the stubble after harvest will prove an effective remedy.

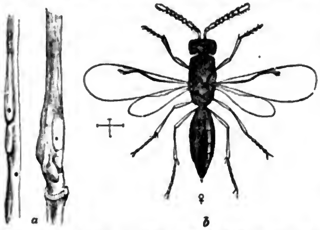


FIG. 18.—*Isosoma hordei:* a, pieces of straw showing galls (natural size); b, female fly (enlarged).

THE WHEAT-MIDGE (*Diplosis tritici* Kirby). The wheat-midge is a European insect, and was introduced into this country about 1828. It is closely allied to the Hessian fly, but its larva works in the heads instead of the stalks of the wheat. It has done but little damage for a number of years, although formerly considered one of the worst enemies of the farmer. The eggs are laid upon the heads in the latter part of May or the first of June, and the larvæ feed upon the kernels until perhaps August or September, when they enter the ground and spin delicate cocoons, in which they pass the winter, transforming to pupæ in April or May. *Remedies:* Burning the "screenings" after threshing; deep ploughing after harvest.

THE CHINCH-BUG (*Blissus leucopterus* Say), see article CHINCH-BUG.

THE HESSIAN FLY (*Cecidomyia destructor* Say), see article HESSIAN FLY.

THE ARMY-WORM (*Leucania unipuncta* Haw.), see article ARMY-WORM.

CUT-WORMS (family *Noctuidæ*, genera *Agrotis*, *Mamestra*, *Hadena*, and *Prodenia*). Nearly all field-crops and garden vegetables suffer from the attacks of the terrestrial cut-worms, while the buds of fruit trees are sometimes eaten out by the climbing cut-worms. "Cut-worm" is a general term applied to the larvæ of Noctuid moths of the genera mentioned above. Most of them are smooth, naked, greasy-looking worms, of some shade of green, gray, brown, or black. They are usually single- or double-brooded, the moths laying their eggs in late summer or in the spring. The larvæ feed at night, remaining in holes under the surface of the ground or under sticks or stones during the day. The great majority of the species hibernate underground as partly-grown larvæ. Cut-worms are destroyed by many predaceous insects, particularly by the ground-beetles, and several parasites, hymenopterous and dipterous, prey upon them. *Remedies:* Climbing cut-worms may be stopped in their work by smooth tin bands around the trunks of the trees, and also by claying the ground for a short distance around the base. The common field cut-worms may be destroyed by wholesale by dropping between the rows of the crop to be protected, at nightfall, balls or masses of fresh-cut grass or clover or turnip-leaves which are sprinkled with the Paris-green or London-purple solution.

WIRE-WORMS (family *Elateridæ*). These worms are long, slender, and horny, and are the larvæ of several species of "click-beetles" or "snapping-bugs." They injure many field-crops—corn, grains, grasses, and potatoes. Authorities vary in placing the length of the larval life at from two to five years. *Remedies:* Late fall and early spring ploughing, exposing the worms to the action of birds. In small fields they may be trapped in large numbers with slices of potato placed on or just beneath the surface of the ground.

LOCUST, ROCKY MOUNTAIN, and its Eastern prototypes (*Caloptenus spretus*, *C. femur-rubrum*, and *C. atlanis*), see article LOCUST.

Insects injurious to Garden Vegetables.

THE IMPORTED CABBAGE-WORM (*Pieris rapæ* Schrank). This worm is the larva of a common European butterfly, and was imported into the United States by way of Canada in 1865 or 1866. At present it is found all through the Northern and Western States. There are two broods each year, and the pupæ of the second brood hibernate. The eggs are laid on the lower side of the leaves, and the green larvæ bore to the heart of the cabbage. When ready to pupate they leave the heads and transform under some neighboring stick or in some fence-corner. Two parasites have been bred from the pupæ—the one a Tachinid fly, and the other a Chalcid, which has been identified, though there are doubts as to its correctness, as *Pteromalus puparum* (L.). *Remedies:* Catching the white butterflies in a hand-net; trapping the pupæ under boards placed between the rows and elevated slightly from the ground; one part pyrethrum diluted with twenty parts flour and sifted over the plants; a saturated infusion of pyrethrum sprinkled upon the cabbages will also be effectual and cheap.

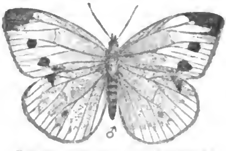


FIG. 20.—*Pieris rapæ:* male butterfly (natural size.)

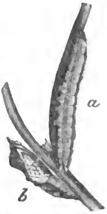


FIG. 19.—*Pieris rapæ:* a, larva; b, chrysalis (natural size).

THE SOUTHERN CABBAGE BUTTERFLY (*Pieris protodice* Boisd.). This insect is found in nearly every portion of the country from Texas to Connecticut, but is rare in the Northern States. Like the preceding species. it is two-brooded and hibernates in the pupa state. Its larvæ, however, feed upon the outside leaves instead of boring to the heart. The same remedies may be used as for the imported worm.

THE POTHERB BUTTERFLY (*Pieris oleracea* Boisd.). This is exclusively a Northern species, and rarely reaches as far south as Pennsylvania. Its habits are precisely similar to those of the preceding, except that it seems to be injurious to all cruciferous plants, and the same remedies may be used for its destruction.

THE CABBAGE PLUSIA (*Plusia brassicæ* Riley). This is one of the most serious cabbage pests of the more southern portion of the country. The eggs are laid singly or in small clusters on both sides of the leaves, and the larvæ feed first upon the outside leaves, and afterwards bore a short distance into the head proper. The pupa is formed in a delicate white silken cocoon, which is attached to the leaves or to any rubbish near the base of the plant. There are four broods a year in the latitude of Washington, and both pupæ and moths hibernate. A large proportion of the late fall larvæ are destroyed by the Chalcid parasite, *Copidosoma truncatellum* (Dalm.), and the common form of *Apanteles congregatus* (Say), has also been bred from them. *Remedies:* The use of the diluted pyrethrum powder and infusion, as described under the head of the imported cabbage-worm, is to be recommended.

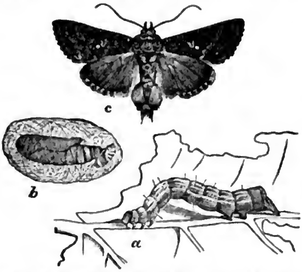


FIG. 21.—*Plusia brassicæ*: *a*, larva; *b*, pupa; *c*, male moth (natural size).

THE HARLEQUIN CABBAGE-BUG (*Murgantia histrionica* Hahn). This is distinctively a Southern insect, and does great damage to all cruciferous plants in many of the Southern States. There seem to be two generations in a year, and the perfect insects hibernate. *Remedies:* Hand-picking is the only remedy which has been practised with success, but the preparations of pyrethrum mentioned under the imported cabbage-worm will probably repay trial.

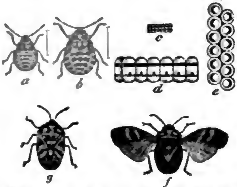


FIG. 22.—*Murgantia histrionica*: *a*, larva; *b*, pupa (slightly enlarged); *c*, eggs; *f*, mature bug, with wings open; *g*, mature bug, with wings closed (natural size); *d*, *e*, eggs from side and top (enlarged).

THE PEA-WEEVIL (*Bruchus pisi* Linn). The female weevils deposit their eggs on the outside of the young pod, and the larvæ penetrate to the interior of the growing peas and attain their growth, usually avoiding the germ. They undergo the pupa state within the peas, and while some of the beetles issue in the fall, the majority remain in the peas till spring. *Remedies:* Weevil-eaten peas may be detected by being thrown into water, as they float under such circumstances, while the sound ones sink. The unsound peas should either be destroyed entire, or the weevils killed by submitting the infested peas to the fumes of bisulphide of carbon in a closed vessel.

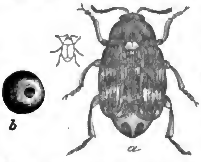


FIG. 23.—*Bruchus pisi*: *a*, weevil (enlarged); *b*, pea, from which it has escaped (natural size).

THE BEAN-WEEVIL (*Bruchus fabæ* Riley). This bean-weevil, although congeneric with the above species, has very different habits. The pea-weevil oviposits on the young, growing pod in the field; the bean-weevil on the beans themselves. The former produces but one brood annually. There develops but one larva to a pea, and it never multiplies in stored peas. The latter continues breeding in stored beans throughout the year, and several develop in the same bean, the number depending on the size of this last. Hence the remedies for the bean-weevil must aim at preventing access by the weevils to stored beans, in addition to the destruction of the insects already in the beans when stored; which may be accomplished by the same methods recommended for the pea-weevil. To prevent access to the beans after disinfection they must be kept in air-tight vessels.

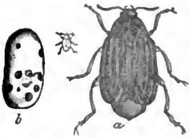


FIG. 24.—*Bruchus fabæ*: *a*, weevil (enlarged); *b*, infested bean.

COLORADO POTATO-BEETLE (*Doryphora 10-lineata* Say), see article COLORADO POTATO-BEETLE.

BLISTER-BEETLES (Meloïd genera *Macrobasis*, *Epicauta*, etc.). Several species of these two genera, notably *Macrobasis cinerea* (Fabr.), *M. murina* (Lec.), *albida* (Say), *Epicauta vittata* (Fabr.), *E. convolvuli* (Mels.), *E. pennsylvanica* (Deg.), and *E. maculata* (Say), often do much damage to potato- and beet-crops. The larvæ are partially parasitic in the nests of wild bees and in the egg-cases of locusts. (See Riley's article in *Transactions* Academy of Sciences of St. Louis, vol. iii.) *Remedies:* All of these beetles are easily driven, and a general method of destruction is to drive them into windrows of straw and kill them by burning. They may also be caught in hand-nets, and also destroyed by Paris-green or London-purple solutions.

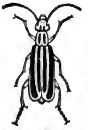


FIG. 25.—*Epicauta vittata* (natural size).

THE STRIPED CUCUMBER-BEETLE (*Diabrotica vittata* Fabr.). This very familiar beetle makes its appearance in early spring, and feeds upon the buds and young leaves of the cucumber. Its larvæ are elongate white grubs and feed upon the roots of the plant. There are three or four broods a year, and the pupa winters underground. *Remedies:* Enclosing the young plants in box frames topped with netting; the Paris-green

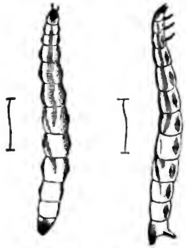


FIG. 26.—*Diabrotica vittata:* larvæ, back and side views (enlarged); hair-lines, showing natural length.

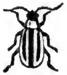


FIG. 27.—*Diabrotica vittata:* beetle (thrice enlarged).

mixture may also be used to advantage. (See page 135.)

Insects injuring Miscellaneous Field-crops.

THE COTTON-WORM (*Aletia xylina* Say), see article COTTON-WORM.

THE COTTON-BOLL WORM or CORN-EAR WORM (*Heliothis armigera* Hübn.). This insect is injurious to many crops—cotton, corn, tomato, bean, pea, pumpkin, squash, melon, and others. It is found in temperate regions throughout the world. To cotton it is injurious by boring into the boll, as its popular name indicates. In our cotton-growing States there are four or five broods a year, the last brood hibernating in the pupa state underground. The earlier broods feed upon corn, and it is chiefly after this has grown hard that they take to cotton. In the Northern States there are two or three broods a year upon corn, the first brood feeding upon the tassels, leaves, and terminal buds, and the last on the hardened ears. Although two parasites are known, neither is abundant, and its most effective natural enemies are the ants. *Remedies:* In the Southern States the best remedy consists in planting a patch of early corn as a trap, carefully "worming" the ears. In the Northern States late fall ploughing will break up the underground pupa-cells, and expose the pupæ to the fatal action of frost and wet.

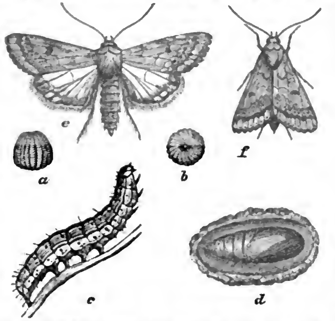


FIG. 28.—*Heliothis armigera: a, b,* eggs, side and top view (enlarged); *c,* larva; *d,* pupa (after Glover); *e,* moth, with wings expanded; *f,* moth, with wings closed (natural size).

THE TOBACCO-WORM (*Sphinx carolina* L.). This is the Southern representative of the Northern tomato-, potato-, or tobacco-worm (*Sphinx 5-maculata* Haw.). There are two, or even three, broods a year, and the insect hibernates underground in the pupa state. *Remedies:* The most common remedy consists in sending negroes through the fields to pick off the worms. Another common remedy consists in poisoning the flowers of the "jimson-weed" (*Datura stramonium*). The moths are particularly fond of sucking these flowers, which are common on tobacco-plantations.

Insects injurious to the Vine.

THE GRAPE PHYLLOXERA (*Phylloxera vastatrix* Planchon), see article PHYLLOXERA.

For a discussion of other grape insects, into which we have not sufficient space to enter, see *Third Missouri Entomological Report* (1870).

Insects injurious to Live-stock.

THE BOT-FLY OF CATTLE (*Hypoderma bovis* Latr.). The adult fly appears from June to September, and lays her eggs upon the backs of cattle. Some authors state that the eggs are simply attached to the hairs, and others that they are inserted in the skin. The larvæ burrow for a short distance beneath the skin, causing painful tumors or abscesses, often of considerable size. An opening through the skin is always maintained in order to supply the larvæ with air. The ensuing spring they emerge from the tumors, drop to the ground, and transform to pupæ within the last larval skin. The pupa state lasts from four to six weeks. *Remedies:* The larvæ may be pressed out from the burrows with the thumb, but in order to avoid the inflammation consequent upon bursting a larva in the abscess, the opening should be slightly enlarged with the scalpel.

THE SHEEP BOT-FLY (*Œstrus ovis* Linn.). The adult flies appear during the whole summer, and, as first pointed out by the immortal John Brown, deposit living young on the margins of the nostrils of the sheep. The larvæ ascend to the maxillary sinuses, and even, it is stated, penetrate the brain through the cribriform plate, feeding upon the mucous secretions and membranes. The transformations are the same as those of the preceding, the larvæ dropping to the ground in spring and remaining in the pupa state for six weeks or two months. *Remedies:* The larvæ may be removed from the nostrils before they have penetrated far by inserting a feather anointed with oil of turpentine and gently moving it about. Dilute carbolic acid injected with a syringe is also beneficial. As a preventive, anointing the nose with coal tar has been recommended, and salt-troughs are smeared with this substance to accomplish this anointing more easily.

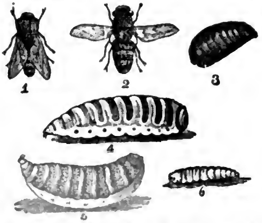


FIG. 29.—*Œstrus ovis: 1,* female fly, with wings closed; *2,* female fly, with wings expanded; *3,* pupa; *4,* larva, dorsal view; *5,* larva, ventral view; *6,* young larva.

THE HORSE BOT-FLY (*Gastrophilus equi* Fabr.). The eggs are attached to the hairs about the knees and shoulders, and are taken into the mouth by the animal licking these parts. Here they immediately hatch, and the young are transferred to the stomach and affix themselves to its walls. They generally occur in clusters in the vicinity of the pylorus. When full grown, after the expiration of eight or nine months, they loosen their hold and fall to the ground with the fæces; often, however, they fasten for a few days to the lining membrane of the intestine or near the anus, causing intense pain. *Remedies:* Frequent currying and clipping the hair removes the eggs. Keep the animals in good health in other respects, so that they can better resist the attacks of the bots until these come away naturally.

The following list gives the principal American writers and writings upon the subject:

Peck, William Dandridge.—We may consider Mr. Peck as the first of the prominent American writers on agricultural entomology. His principal articles are as follows: "The Description and History of the Canker-worm," *Massachusetts Magazine*, 1795, No. 7, pp. 323–327, 415–416, pl. 1; "Natural History of the Slug-worm (*Tenthredo cerasi*)," *Massachusetts Agricultural Report*, 1799, pp. 9–20, 1 pl.; "On Insects which affect Oaks and Cherries," *Massachusetts Agricultural Report*, 1819, pp. 307–313. Peck died in 1822.

Harris, Thaddeus William, M. D.—Dr. Harris's principal work was entitled *A Report on the Insects of Massachusetts Injurious to Vegetation*, and was published in 1841 by order of the Massachusetts legislature. The fourth edition of this valuable work, which was edited by Charles L. Flint, and is commonly known as the "Flint edition," is the one now for sale. Dr. Harris's miscellaneous writings have been collected in a volume entitled *Entomological Correspondence of Thaddeus William Harris, M. D.*, edited by S. H. Scudder and published in 1869 by the Boston Society of Natural History. Dr. Harris has been justly called the father of American agricultural entomology, and his work is still standard. He died Jan. 16, 1856.

Fitch, Asa, M. D.—The great work of Dr. Fitch's life is contained in his reports to the State Agricultural Society of New York, fourteen in number, and published in the *Transactions* of the society from 1854 to 1870, omitting the years 1859, 1865, and 1868. Reports 1 to 11, inclusive, were published separately by the author in four volumes, with indices to each. These reports contain a very large amount of important entomological matter, and gained for Dr. Fitch many honors abroad. He died April 18, 1879.

Rathvon, Simon S.—He has for a number of years conducted an entomological department in the *Lancaster Farmer*, which has contained many articles of value. In the Report of the Department of Agriculture for 1861 he published a long article entitled "Entomology, and its Relation to the Vegetable Productions of the Soil, with Reference to both Destructive and Beneficial Insects." This paper was continued under the same title in the Agricultural Report for 1862.

Glover, Townend.—Mr. Glover's entomological work is intimately connected with the U. S. Department of Agriculture. The department reports for 1854 and 1855 both contained lengthy articles on "Insects Injurious and Beneficial to Agriculture" from his pen. In 1863 he was appointed entomologist to the department, and from that year to his resignation in the spring of 1878 he submitted annual reports. These reports will be found in the Reports of the Department of Agriculture from 1863 to 1877, inclusive. He published in 1874 a very small edition of *Manuscript Notes from my Journal—Diptera*. This was followed by a similar volume on *Hemiptera* in 1876. In 1877 was printed in the same form *Manuscript Notes from my Journal—Entomological Index*, a complete index of his entomological reports; and in 1878 *Manuscript Notes from my Journal—Cotton.*

Trimble, Isaac P., M. D.—Dr. Trimble published in 1865 quite an extensive work entitled *A Treatise on the Insect Enemies of Fruit and Fruit Trees* (N. Y., 1865), in which much practical experience on the codling moth and plum curculio was brought together.

Hind, H. Y.—Mr. Hind is known by his *Essay on the Insects and Diseases Injurious to Wheat-crops* (Toronto, 1857).

Walsh, Benj. Dann, M. A.—One of our most precise and thorough entomologists. He was a very voluminous writer. He was associate editor of the first volume of the *Practical Entomologist* (1865–66), and sole editor of the second volume (1866–67). He was also (with C. V. Riley) editor of vol. i. of the *American Entomologist* (1868–69). His more scientific articles are contained in the *Proceedings* of the Boston Society of Natural History and in the *Proceedings* of the Philadelphia Entomological Society. He was the author of a report on "Insects Injurious to Vegetation in Illinois," published in the *Transactions* of the Illinois State Agricultural Society for 1861. He was the first State entomologist of Illinois, and his chief economic work is his first and only report on the noxious insects of the State of Illinois (1868). He died in 1869.

Riley, Charles Valentine, M. A., Ph.D.—First among Dr. Riley's works on agricultural entomology may be mentioned the Missouri entomological reports. He was appointed entomologist of that State in 1868, and held the position for nine years. During that time he prepared nine annual reports, which were published separately by the author, and may also be found in the reports of the State Board of Agriculture for the years 1868 to 1876, inclusive. In 1881 he issued a general index to these nine reports, a pamphlet of some 180 pp. In 1877, by act of Congress approved March 3, the U. S. Entomological Commission was formed, with Dr. Riley as chief. The joint reports of the commission are as follows: *First Annual Report of the U. S. Entomological Commission, for the year 1877, relating to the Rocky Mountain Locust and the Best Methods of preventing its Injuries and of guarding against its Invasions*, with maps and illustrations (Washington, 1878); *Second Report of the U. S. Entomological Commission, for the years 1878 and 1879, relating to the Rocky Mountain Locust and the Western Cricket, and Treating of the Best Means of subduing the Locust in its Permanent Breeding-grounds* (Washington, 1880). Of the bulletins of the commission, besides the general index to the Missouri reports already mentioned, and which forms Bulletin 6, Dr. Riley is the author of Bulletin 3, the title of which is: *The Cotton-Worm; Summary of its Natural History, with an Account of its Enemies and the Best Means of Controlling it* (Washington, 1880). In 1878 he was appointed entomologist to the U. S. Department of Agriculture, and prepared the report of the entomologist in the annual report for that year (also published separately). He resigned in 1879, and was reappointed in 1881. He is also the author of the following works: *Potato Pests* (New York, 1876); *The Locust Plague in the United States* (Chicago, 1877). He was associate editor, with B. D. Walsh, of the *American Entomologist*, vols. i. and ii. (1868–69), and sole editor of vol. iii. (1880).

Le Baron, Wm., M. D.—Dr. Le Baron was appointed State entomologist of Illinois in 1870. He is the author of four annual reports, which are published in the *Transactions* of the State Horticultural Society, from 1870 to 1874, omitting 1873. He died in 1876.

Packard, Alpheus S., M. D.—The following are the most prominent of Dr. Packard's writings upon agricultural entomology: "The Army-Worm," *Sixth Report Secretary Maine State Board of Agriculture* (1861, pp. 130–142); first, second, and third annual Reports, as entomologist to the Massachusetts State Board of Agriculture, on "The Injurious and Beneficial Insects of Massachusetts" (1871, 1872, 1873); "Report on the Rocky Mountain Locust and other Insects now Injuring or likely to Injure the Field and Garden Crops in the Western States and Territories," *Ninth Annual Report U. S. Geological and Geographical Survey of the Territories, for 1875* (Washington, 1877); *U. S. Entomological Commission, Bulletin 4: The Hessian Fly; its Ravages, Habits, Enemies, and Means of Preventing its Increase* (Washington, 1880); *U. S. Entomological Commission, Bulletin 7: Insects Injurious to Forest and Shade Trees* (Washington, 1881).

Thomas, Cyrus, Ph.D.—Dr. Thomas's principal work is contained in his reports as State entomologist of Illinois, to which position he was appointed in 1876. These reports are six in number, and are contained in the *Transactions* of the State Department of Agriculture for the years 1876 to 1881, inclusive. He is also the author of Bulletin 5 of the U. S. Ent. Com., on the Hessian Fly.

Smith, Sidney I.—As entomologist to the State Board of Agriculture of Connecticut, Prof. Smith made two short reports, which are published in the *Transactions* of the Connecticut State Board of Agriculture for 1871 and 1872.

Comstock, J. Henry.—Prof. Comstock was appointed entomologist to the U.S. Department of Agriculture in the spring of 1879, and continued in office two years. He made two annual reports, which will be found in the Reports of the Department of Agriculture for 1879 and 1880. He also helped to finish a large volume begun by Dr Riley, entitled *Report upon Cotton Insects, prepared under the Direction of the Commissioner of Agriculture* (Washington, 1879).

Lintner, Joseph A.—Mr. Lintner, the recently-appointed State entomologist of New York, has published, since taking office, the following articles on economic entomology: "The Insects of the Clover-Plant," *Fortieth Annual Report New York State Agricultural Society, 1880*; "A New Principle of Protection from Insect Attack," *Proceedings Western N. Y. Horticultural Society, 1882.* He has also published many important articles in the *Cultivator and Country Gentleman.*

Cook, Albert J.—Prof. Cook's writings are mostly of a fugitive character. The *Proceedings* of the Michigan Pomological Society and the *Transactions* of the Michigan Horticultural Society, from 1870 to 1882, contain from his pen many short articles and lectures on agricultural entomology.

Treat, Mrs. Mary B.—Mrs. Treat has compiled a volume entitled *Injurious Insects of the Farm and Garden* (N. Y., 1882).

(C. V. R.)

CHAPTER X.

Wages of Agricultural Labor.

The systematic investigation of the rate of wages paid for farm-labor in the United States has been carried on, year by year, by the Department of Agriculture at Washington since 1866: the reports of the department, from which the facts given herein are mainly taken, furnish ample data for comparison. The number of persons engaged in agriculture far exceeds that engaged in any other department of production, and is shown, with those engaged in manufactures, by the following table, taken from the census of 1880:

Table showing the Number and Sex of Persons engaged in Agriculture and Manufacturing Industries in the United States, by States and Territories, 1880.

States and Territories.	Population.	Agriculture.			Manufactures.			
		Total.	Male.	Female.	Total.	Male.	Female.	Children and youth.
Total, United States	50,155,783	7,670,493	7,075,983	594,510	2,738,895	2,025,335	531,639	181,921
Alabama	1,262,505	380,630	291,477	89,153	10,019	8,368	842	809
Arizona	40,440	3,435	3,423	12	220	216	2	2
Arkansas	802,525	216,655	195,002	21,653	4,557	4,307	90	160
California	864,694	79,396	78,785	611	43,693	38,311	3,922	1,460
Colorado	194,327	13,539	13,462	77	5,074	4,652	266	156
Connecticut	622,700	44,026	43,936	90	112,915	75,619	28,851	8,445
Dakota	135,177	28,508	28,368	140	868	854	8	6
Delaware	146,608	17,849	17,609	240	12,638	10,250	1,426	962
District of Columbia	177,624	1,464	1,445	19	7,146	5,496	1,389	261
Florida	269,493	58,731	47,465	11,266	5,504	4,564	558	382
Georgia	1,542,180	432,204	329,856	102,348	24,875	18,937	3,619	2,319
Idaho	32,610	3,858	3,847	11	388	374	8	6
Illinois	3,077,871	436,371	433,796	2,575	144,727	120,558	15,233	8,936
Indiana	1,978,301	331,240	329,614	1,626	69,508	62,072	3,615	3,821
Iowa	1,624,615	303,557	302,171	1,386	28,372	25,382	1,431	1,559
Kansas	996,096	206,080	205,234	846	12,062	11,139	392	531
Kentucky	1,648,690	320,571	315,445	5,126	37,391	30,949	3,529	2,913
Louisiana	939,946	205,306	147,538	57,768	12,167	10,171	1,335	661
Maine	648,936	82,130	81,887	243	52,954	35,431	13,777	3,746
Maryland	934,943	90,927	89,176	1,751	74,945	46,698	21,700	6,547
Massachusetts	1,783,085	64,973	64,746	227	352,255	228,834	105,976	17,445
Michigan	1,636,937	240,319	239,346	973	77,591	68,445	4,784	4,362
Minnesota	780,773	131,535	130,817	718	21,247	18,937	1,636	674
Mississippi	1,131,597	339,938	252,324	87,614	5,827	4,887	413	527
Missouri	2,168,380	355,297	351,681	3,616	63,995	54,200	5,474	4,321
Montana	39,159	4,513	4,504	9	578	574	3	1
Nebraska	452,402	90,507	89,881	626	4,793	4,464	120	209
Nevada	62,266	4,180	4,146	34	577	556	5	16
New Hampshire	346,991	44,490	44,299	191	48,831	29,356	16,184	3,291
New Jersey	1,131,116	59,214	58,819	395	126,038	86,787	27,099	12,152
New Mexico	119,565	14,139	14,025	114	557	553	……	4
New York	5,082,871	377,460	375,213	2,247	531,533	364,549	137,455	29,529
North Carolina	1,399,750	360,937	314,228	46,709	18,109	12,818	2,939	2,352
Ohio	3,198,062	397,495	396,120	1,375	183,609	152,217	18,563	12,829
Oregon	174,768	27,091	27,000	91	3,473	3,280	96	97
Pennsylvania	4,282,891	301,112	299,809	1,303	387,072	284,359	73,046	29,667
Rhode Island	276,531	10,945	10,910	35	62,878	37,060	18,270	7,548
South Carolina	995,577	294,602	208,672	85,930	22,128	19,987	1,023	1,118
Tennessee	1,542,359	294,153	275,620	18,533	22,445	19,575	1,196	1,674
Texas	1,591,749	359,317	330,125	29,192	12,159	11,645	116	398
Utah	143,963	14,550	14,470	80	2,495	2,042	221	232
Vermont	332,286	55,251	55,037	214	17,540	14,438	2,271	831
Virginia	1,512,565	254,099	238,951	15,148	40,184	28,779	6,144	5,261
Washington	75,116	12,781	12,709	72	1,147	1,110	25	12
West Virginia	618,457	107,578	106,980	598	14,311	12,900	346	1,065
Wisconsin	1,315,497	195,901	194,380	1,521	57,109	48,255	6,241	2,613
Wyoming	20,789	1,639	1,635	4	391	380	……	11

[Persons engaged in agriculture include agricultural laborers, apiarists, dairymen and dairywomen, farm-overseers, farmers, florists, gardeners, nurserymen, vine-growers, stock-drovers, stock-herders, stock-raisers, turpentine-farmers, and laborers. The males engaged in manufacturing industries are above sixteen years of age, the females above fifteen years of age, while those of both sexes under the respective ages given are classified as children and youth.]

The monthly average, without board, for the different sections of the country is, for the

Eastern States	$26.61
Middle States	22.24
Southern States	15.30
Western States	23.63
California	38.25

The tables well illustrate the influence of manufactures upon wages of farm-labor. This influence is felt in comparatively small districts as well as in those more extended; for instance, in the State of Ohio the northern belt includes the great manufacturing towns, Cleveland, Toledo, Wooster, Mansfield, etc., and the average monthly wage for farm-labor is $25.96. In the eastern belt, having iron and coal industries and but little variety in general mechanical trades, the average monthly wage is $22.65. Through the western belt having more manufacturing than the eastern, but less than the northern, and including several prominent manufacturing towns, Cincinnati, Columbus, Dayton, and Springfield, the average monthly wage for farm-labor is $24.75. Illinois, treated in the same way, only designating the districts by northern, central, and southern, shows the same general results, with wages at $27.52, $24.05, and $19.87 respectively.

The rate is higher in Massachusetts than in any other State east of the Rocky Mountains and lowest in those States more exclusively dependent upon the products of the soil.

The following table shows the average monthly wages by the year, and the average daily wages in harvest-time, for the different States, for 1882:

States and Territories.	Monthly wages by the year.		Daily wages in harvest-time.	
	Without board.	With board.	Without board.	With board.
Maine	$24.75	$16.15	$1.52	$1.22
New Hampshire	25.25	16.72	1.71	1.35
Vermont	23.37	16.00	1.75	1.35
Massachusetts	30.66	18.25	1.75	1.35
Rhode Island	27.75	17.00	1.60	1.30
Connecticut	27.90	17.37	1.65	1.33
New York	23.63	15.36	1.89	1.47
New Jersey	24.25	14.20	2.09	1.74
Pennsylvania	22.88	14.21	1.73	1.30
Delaware	18.20	12.50	1.60	1.25
Maryland	16.34	9.89	1.52	1.15
Virginia	13.96	9.17	1.27	.99
North Carolina	12.86	8.80	1.20	.85
South Carolina	12.10	8.10	1.08	.78
Georgia	12.86	8.70	1.10	.80
Florida	16.64	10.20	1.12	.80
Alabama	13.15	9.09	1.05	.80
Mississippi	15.10	10.09	1.23	.95
Louisiana	18.20	12.69	1.10	.85
Texas	20.20	14.03	1.39	1.08
Arkansas	18.50	12.25	1.34	1.02
Tennessee	30.75	9.49	1.30	1.00
West Virginia	19.16	12.46	1.30	1.00
Kentucky	18.20	11.75	1.54	1.18
Ohio	24.55	16.30	1.79	1.41
Michigan	25.76	17.27	2.13	1.76
Indiana	23.14	15.65	1.89	1.58
Illinois	23.91	17.14	1.91	1.54
Wisconsin	26.21	17.90	2.50	2.10
Minnesota	26.36	17.75	2.61	2.16
Iowa	26.21	17.95	2.25	1.81
Missouri	22.39	13.95	1.59	1.23
Kansas	23.85	15.87	1.70	1.35
Nebraska	24.45	16.20	1.95	1.57
California	38.25	23.45	2.30	1.86
Oregon	33.50	24.75	1.92	1.50
Colorado	36.50	27.08	2.21	1.80
Utah	....	....	2.00	1.56
New Mexico	....	....	1.65	1.40
Dakota	....	....	2.65	2.19

This variation of the rate of wages for farm-labor in manufacturing and agricultural districts is true of all countries, and has been clearly shown as between the northern, or manufacturing, counties of England, and the southern, or agricultural, counties. This is still more remarkably illustrated in Belgium, where farm-wages, according to Prof. Laveleye, are nearly twice as high in the Walloon provinces as in the Flanders provinces, the transition occurring within ten miles.

From these facts the following law may be deduced: wherever mechanical industries flourish, and the number of persons engaged in them exceeds the number engaged in agriculture. the wages paid for farm-labor will be found to be higher than in districts where the reverse conditions exist. This is also true of the prices of farm-products.

Daily wages in harvest-time compare favorably with wages paid in manufacturing industries, but monthly rates, by the year, are considerably less. Adult male labor upon the farm is paid, on the average, in the United States, $25.21 per month without board, while the adult male in mechanical employment is paid at least $40 per month.

The fluctuations in agricultural wages, by the month and without board, for different sections of the country since 1866, are shown in the following table:

	1882.	1879.	1875.	1869.	1866.
Eastern States	$26.61	$20.21	$28.96	$32.08	$33.30
Middle States	22.24	19.69	26.02	28.02	30.07
Southern States	15.30	13.31	16.22	17.21	16.00
Western States	23.63	20.38	23.60	27.01	28.91
California	38.25	41.00	44.50	46.38	35.75

(C. D. W.)

See NEAT CATTLE (including DAIRY and DAIRY PRODUCTS), HORSES, MULES, POULTRY, SHEEP, SOILS, SWINE.

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AHAB. See Vol. I. p. 373 Am. ed. (p. 420 Edin. ed.). In the article on AHAB in the *Encyclopædia Britannica* it is correctly intimated that the parts of the book of Kings which contain the history of that monarch were evidently compiled from more sources than one. But it is also intimated that some parts of the account are shown by their disagreement with other parts to be of less historical value. This is a case in which attention to the dates will obviate most of the difficulties and repel the suspicion cast upon the trustworthiness of the narratives.

In 2 Chronicles xviii. 1 it is said that Jehoshaphat formed a marriage-alliance with Ahab. As this statement occurs at the beginning of the account of Jehoshaphat's visit to Ahab, just before the battle of Ramoth-Gilead, many have assumed that it was the intention of the narrator to say that the marriage-alliance was formed *at that time.* It is this assumption, for which there is no ground whatever, which creates all the difficulties that have been found in these narratives. The marriage-alliance must, of course, have been that between Jehoram the son of Jehoshaphat and Athaliah the daughter of Ahab. Ahaziah of Judah, the son of this marriage, came to the throne at the close of the eleventh year—that is, the beginning of the twelfth year—of Joram, king of Israel (2 Kings viii. 25 and ix. 29). He was then twenty-two years old (2 Kings viii. 26). Joram's first year was the eighteenth of Jehoshaphat's (2 Kings iii. 1). Hence, Ahaziah of Judah was born in the seventh year of the reign of Jehoshaphat. As Jehoshaphat came to the throne not later than the close of the fourth year of Ahab (1 Kings xxii. 41), the birth of Ahaziah was not later than the eleventh year of Ahab, and the marriage of his parents not later than Ahab's tenth year. It follows that Ahab's own marriage with Jezebel, the mother of Athaliah, must have been during the reign of his father Omri, several years before his own succession to the throne, and apparently during the first four years of Omri's reign, while his right to the throne was disputed by Tibni (1 Kings xvi. 23, 29, and *Jos. Ant.*, viii. 12. 5). The three children of Ahab and Jezebel must all have been born either before Ahab became king or during the earliest years of his reign. Add to this that these three children were named respectively Athaliah, Ahaziah, and Joram—all three names being compounded with the name Jehovah—and we have the following cast of events: Ahab came to the throne strengthened indeed by the Tyrian alliance on the one hand, but, on the other hand, a worshipper of Jehovah. The marriage of Jehoram and Athaliah was part of a plan to reunite the two kingdoms under a king of the house of David and under the religion of Jehovah. This was an event, therefore, which a prophet of God might well celebrate in a song like the forty-fifth Psalm. It was not till after the forming of the marriage-alliance that Jezebel led her husband to establish the worship of Baal. With this cast of the history all the recorded incidents of the reign of Ahab easily fall into their places, and are seen to be consistent.

(W. J. B.)

AHLQUIST, AUGUST ENGELBERT, a Finnish linguist and writer, born Aug. 7, 1826, in Kuopio, in Savolaks, Finland. He has devoted his life both to a scientific study of the Finnish dialects and to the elevation of the national vernacular of his country. His object is to make Finnish the language of the schools, the pulpit, and the press, and he champions his cause with no less ability than Ivar Aasen has defended a similar cause in Norway. Ahlquist has also contributed much toward the creation of a national Finnish literature. For the latter purpose he founded in 1847 a Finnish periodical, *Suometar*, in which he wrote under the *nom-de-plume* "Oksanen." In the interest of his linguistic and ethnographical studies he visited the remnants of the almost extinct tribe of the Wotes, and wrote a grammar of their language, *Wotisk Grammatik* (Helsingfors, 1855). During a sojourn in Dorpat he learned the Esthonian language, and he devoted the years 1853–58 to travels in Northern Russia and Western Siberia in order to acquaint himself with the languages and customs of the tribes of the Ural-Altaic family. He suffered great privations and hardships, but the scientific results were magnificent. Of the journey itself he published a work in Finnish, *Muistelmia matkoilta Wenäjällä vuosina, 1853–58* (Helsingfors, 1860). Then followed, in German, *Versuch einer Mokscha-Mordwinischen Grammatik* (St. Petersburg and Leipzig, 1861), to which was added in 1871, *Die Kulturwörter der westfinnischen Sprachen.* The latter was written in Swedish, but appeared soon afterwards in a German and in a Russian translation. In 1862, Ahlquist was appointed professor of Finnish language and literature in Helsingfors, and he has continued to contribute in many ways to the elevation of his country's language. He has published a volume of original poems in Finnish, entitled *Säkeniä* ("Sparks," 4th ed., Helsingfors, 1881), and has translated Schiller's *Lied von der Glocke* and his *Cabale und Liebe* into Finnish.

(R. B. A.)

AHNFELD, ARVID, a Swedish writer and journalist, born Aug. 16, 1845, in Lund. In 1870 he became associate editor of the *Aftonblad*, and in 1881 editor-in-chief of *Ur Dagens Krönika.* His chief work is his *Verlds-literaturens Historia* ("History of the World's Literature," 1874–76), which is based on Scherr's work; but the chapter on Scandinavian literature is wholly original, and the work is ornamented with 800 portraits. Ahnfeld has also published a number of monographs on distinguished Swedish writers. He is now engaged on a great historical work, *Ur svenska hofvets och aristokratiens lif* ("The Life of the Swedish Court and Aristocracy"), of which six large volumes have been published.

AHRENS, HEINRICH (1808–1874), a German jurist and psychologist, was born at Kniestedt, Hanover, July 14, 1808. He received his education at the University of Göttingen, and afterwards took an active part in the political disturbances of 1831, in consequence of which he was forced to take refuge in Paris. Here he studied the French language and literature, wrote for French periodicals, and in 1836 gave a gratuitous course of lectures on German philosophy since Kant, which were published the following year. In 1839 he became professor of philosophy at Brussels, declining similar positions in the universities of Leyden and Utrecht. This post was held till 1848, when he was sent by his native city to the German national Parliament at Frankfort, and was a member of the committee appointed to draw up a German constitution. In 1850 he was chosen professor of legal and political science at Graz, and in 1859 of practical philosophy and political science at Leipsic. In 1863 he was elected to represent the University of Leipsic in the first chamber of Saxony. He died at Salzgitter, Aug. 4, 1874. He published in French *Cours de Psychologie* (2 vols., Paris, 1837–38) and *Cours du Droit naturel* (Paris, 1838); this work has gone through six editions. He published a revision of it in German as *Die Rechtsphilosophie oder das Naturrecht auf philosophisch-anthropologischer Grundlage* (Vienna, 1851; 6th ed. 1870–71). It has also been translated into Italian, Spanish, Portuguese, and Hungarian, and is used as a basis for academical studies in Brazil, Peru, and Chili. To it he afterwards added a second part, containing *Die organische Staatslehre* (Vienna, 1850). His *Die Juristische Encyklopädie* (1855–57) has been translated into Italian, Russian, and Polish. His latest work was *Die Abwege in der neuen Deutschen Geistes entwickelung, etc.* (Prague, 1873).

AIKEN, the county-seat of Aiken co., S. C., is on the South Carolina Railroad, 120 miles N. W. from Charleston and 17 miles from Augusta. On account of the porous soil and good natural drainage the atmosphere is kept dry, and is very suitable for persons suffering from throat and lung affections. Aiken has become a favorite winter resort for Northern invalids, 4000 visiting it annually. It is handsomely laid out with streets 150 feet wide, and has several large hotels and boarding-houses, well kept. It has seven churches, good private and public schools, a lyceum-hall, and a weekly newspaper. Population, 1817.

AILANTHUS, a well-known Chinese tree which is extensively cultivated in the United States. It is described and figured under this name by L'Héritier, a noted French author of the last century, erroneously using the orthography, apparently, *anthus* being a derivative from the Greek word for flower, whereas he states in the text that he intended to derive it from its Chinese name "aylanto." Hence it is written *ailanthus* and *ailantus* by different authors. The Chinese name signifies "approaching the heavens or the sky," on account of its tall and rapid growth, and hence the common English name, "tree of heaven." It grows as rapidly in our own country as in its own, occasionally reaching ten feet in two years from the seed. The seed was first sent to the celebrated English botanist Philip Miller from China by D'Incarville, a Jesuit missionary, about 1751, and was at that time erroneously believed to be a species of *Rhus*, the varnish tree of Japan, under which name it is yet known in France. Its real relationship is rather with *Rutaceæ*, of which the *Ptelea trifoliata*, or "hop tree," is an American representative. It has not dotted leaves, however, as the genuine plants of that order have, and this absence is a distinguishing mark of the order *Simarubiaceæ*.

It is valued highly in China as food for *Attacus cynthia*, one of the silkworms, and from which the most durable of all silks is produced. In 1856 this worm was successfully introduced into Italy by Father Fantoni, a Piedmontese priest residing in the Chinese province of Shan-Tung. The emperor Napoleon interested himself warmly in its introduction into France, which, by the aid of M. Guérin-Méneville, was accomplished, and the Ailanthus was planted to a great extent in the interest of silk-culture. Thousands of persons in France and Algeria now raise the ailanthus for this species of silkworm. In 1861 the ailanthus worm was successfully introduced to America by Dr. Thomas Stewardson of Philadelphia; but so far the ailanthus has not equalled the mulberry in popularity for silkworm culture. The Rev. Dr. Morris of Baltimore, after careful experiments with the ailanthus silkworm, believes that it will furnish silk at not one quarter the cost of that from the mulberry.

So far as known, no insect but *Attacus cynthia* feeds on it; and this, with its extremely rapid growth, brought it favor on its introduction as a street tree, as also did its power to resist the smoke and dust of cities. It is one of the few trees which thrive in spite of the smoke of Pittsburg. It became unpopular through the disagreeable odor of the male flowers. The sexes are separate on distinct trees; the female flowers are nearly odorless. Isaac C. Martindale, however, reports that at Camden, N. J., a tree with flowers of one sex may change to the other under some circumstances; selection of female trees might not therefore be absolute security against the bad odor emitted by the male. The leaves have a disagreeable smell when rubbed, and are believed, probably erroneously, to occasionally emit unhealthy gases. A tree in the Bartram Gardens, introduced in the early part of the century, had in 1853 attained a height of sixty feet and seven feet in circumference. In 1880 it was still about this height, which is therefore its maximum in the vicinity of Philadelphia.

It is believed to be a very valuable timber-tree. As to its durability in the form of posts, the testimony is so far conflicting. For strength and durability, where not exposed, there seems no doubt of its great value. For good growth under hardships there is no tree equal to it. The Russians have successfully employed it in reclaiming the arid steppes of the interior, and the Eastern Railway Company of France have planted it all along their line to bind together the earth on the embankments. In America the Kansas Pacific Railway planted in 1871 an experimental plantation as far out in the desert as it was thought any trees would grow; in 1873, though most of the kinds had died, the Ailanthus was found growing finely. Along the sea-coasts it resists the salt sea-breezes, and grows rapidly in the poorest sands. In the interior, at Terre Haute, Ind., Dr. Warder found it twenty-two inches in circumference in twenty-four years, or about the same ratio as given in the cottonwood, catalpa, white pine, and chestnut. The seeds do not long retain their vital powers; one experiment reports only three growing out of 150 kept three years. (T. M.)

AILLY, Pierre d', or **Petrus de Alliaco** (1350–1420), the "Eagle of the Doctors" (*Aquila Doctorum*) of France, and the "Hammer of Heretics" (*Malleus Hæreticorum*), was born of humble parentage at Ailli-le-haut-Clocher in 1350, and educated at the College of Navarre in the University of Paris. So marked were his ability and industry that he was early appointed a lecturer of the university, and at thirty had attained his doctorate. His services in forwarding the Franciscan controversy on behalf of the Immaculate Conception of the Virgin Mary against John de Montesono and the Dominicans were rewarded by his appointment in 1389 as chancellor of the university and almoner and confessor of Charles VI. This position he held till he was succeeded by his pupil, Gerson, in 1395. His life was coincident with the great schism of Christendom, and much of his best effort was devoted to healing it. When the University of Paris invited the opinions of the learned upon the best method of closing the schism, D'Ailly and Gilles Deschamps were appointed to assist Nicholas Clemangis in drawing up the judgment of the university upon them (July, 1394). But the journey of D'Ailly to the court of Avignon with the judgment was fruitless. Equally without avail was his journey to the courts of Avignon and Rome to urge upon the rival popes the recommendation to abdicate determined upon by the emperor Wenceslaus and the king of France in March, 1398.

Through these efforts there arose a constitutional party at Paris advocating the supremacy of the Church, represented in general council, over the pope, and demanding by its means reform in the Church, head and branches. This was set forth by D'Ailly in a tract, *Of the Difficulty of a Reform in a General Council* (1410), after the abortive Council of Pisa. In the same year he was translated from the bishopric of Puy to the archbishopric of Cambrai, and, in 1411, to propitiate the constitutional reformers, he, together with Zabarella and Fillostre, was appointed cardinal by John XXIII., and was sent as legate to Germany.

When the council met at Constance (1414) he was arrayed among its leaders. He preached the sermon before the emperor urging the necessity of reform, and to avoid the preponderance of Italian bishops induced the council to take the vote by nations, and not by heads. This was followed (May, 1415) by his tract maintaining the authority of the general council over the pope (afterward developed into his treatise *On Ecclesiastical Power*); and after the flight of John and his cardinals he presided at the third session of the council, which decided that the absence of the pope did not affect the authority of the council.

D'Ailly was equally active in guiding the action of the council in the trial of Huss. He was a member of the commission on Huss (appointed April 6, 1415), and throughout took a strong part against him, on the ground of his opposition to the Church, his preaching against the cardinals, and his sympathy with Wycliffe; and he led the controversy against the Realistic views of Huss. Throughout, his efforts were directed toward fairness in the trial, and when in the trial of Jerome of Prague a recantation had been made, he insisted upon a release, and upon the refusal of the council resigned as a judge. In the same spirit he assisted Chancellor Gerson in the effort to procure the condemnation of Jean Petit.

In the later sessions of the council he favored the demand of Aragon that the vote of England should be included in that of the German nation, while his desire to uphold the power of the Church made him favor the retention of the objectionable annates. The three claimants to the papal throne were removed by the council, and Martin V. succeeded. The new pope appointed D'Ailly legate to Avignon, whereupon he resigned his archbishopric. He died at Avignon Aug. 9, 1420, bequeathing his papers and books to the College of Navarre. A list of these is given in Montfaucon, *Bibliothèque Universelle des Manuscrits*, and by Launoi in the *Gersoniana* of Dupin. It is to be observed that, in common with his age, D'Ailly was imbued with the belief in the influence of astronomical phenomena upon human affairs. He took a profound interest in natural and physical science. Among his works are these: *Libellus de Emendatione Ecclesiæ; Concordantiæ Astronomiæ cum Theologia, et Concordantiæ Astronomiæ cum Historia* (Vienna, 1490); *Treatises and Discoveries* (printed at Strasburg, 1490); *Life of Pope Celestine V.* (Paris, 1539); *Météores* (Strasburg, 1504, and Vienna, 1509); and a noted tractate called *Cosmologia*. The treatise on the *Reform of the Church* is printed in the *Fasciculus Rerum Expetendarum*, etc., vol. i. See Dinaux, *Notice Historique sur P. d'Ailly* (1824). (P. H. H.)

AINSWORTH, William Harrison (1805–1882), an English novelist, born at Manchester, England, Feb. 4, 1805. The son of a lawyer, he entered upon the study of the law, but soon, following a stronger inclination, he deserted it to devote himself to literature. At an early age he wrote articles for several of the magazines, principally *The European*, *Constable's Edinburgh*, and the *London Magazine*. In 1824 he established a small paper in Manchester called *The Iris*, and in the same year published a volume of poems under the pseudonym of "Cheviot Tichbourne." The next year he went to London, and made his first adventure in the field of romance by the publication of a novel entitled *Sir John Chiverton*, which received the approbation of Sir Walter Scott and gave him an immediate popularity. In 1829 he edited *The Keepsake*, which was very successful. In 1826 he married Miss Ebers, a daughter of the lessee of the Italian Opera in London. In 1834 he published a novel called *Rookwood*, somewhat in the sensational style of Mrs. Radcliffe, and in 1839 his best-known and most successful work, *Jack Sheppard*, appeared first in *Bentley's Miscellany*. In this he describes the marvellous adventures of a famous English robber whose boldness in crime is equalled by the ingenuity of his escapes. It throws an air of admiring sentiment over the criminal which would lead weak but adventurous minds to imitate the evil deeds in hope of the immunity from punishment and from a love of the excitement. Its influence is decidedly evil. *Crichton* appeared in 1837, and added to his peculiar reputation. Among his other novels, which are very numerous, the chief are—*Guy Fawkes* (1840), *James II.*, *The Miser's Daughter* (1843), *Old St. Paul's* (1843), *The Tower of London* (1846), *The Lancashire Witches* (1848), *The Flitch of Bacon* (1854), *The Star Chamber* (1854), *The Lord Mayor of London* (1862), *Charles Stuart in Madrid* (1870), *Boscobel; or, The Royal Oak* (1872), and *Merry England* (1874). His connection with several magazines aided these literary ventures. In 1840 he succeeded Charles Dickens as the editor of *Bentley's Miscellany*, and in 1842 established *Ainsworth's Magazine*. In 1845 he bought the *New Monthly Magazine*, but, though his novels never lost their popularity, his career as a publisher was short. His last novel, *Stanley Brereton*, appeared in 1881. He died at Reigate, Surrey, Jan. 2, 1882. He was the last survivor of the school of historical novelists who followed Sir Walter Scott at a distance. Very fertile in imagination and prolific in production, he was remarkable for the variety of his characters and incidents, for his descriptions of localities and scenes, and for his delineation of manners. He is always decidedly English, and, as many of his scenes are laid in London and Lancashire, his works have had great popularity at home. Many of them have also been translated into continental languages. (H. C.)

AIR-PLANTS. This is the popular name applied to those plants which attach themselves to trees and seem to sustain themselves by sending roots out into the atmosphere. They are technically called *epiphytes* (see article Botany, Vol. IV. p. 84 Am. ed., p. 94 Edin. ed.), or "growers on plants," as distinguished from parasites, which penetrate and actually live on the substance of the trees they attach themselves to. Plants of many natural orders, with no affinity between them, have representatives in this class; but in the United States those known by the name of air-plants are chiefly Orchids or Bromeliaceous plants. They are not strictly air-plants, for on burning them they are found to have many of the mineral constituents common to all plants, and which they probably derive from the decaying substances about the branches on which they are supported. One of the *Bromeliaceæ*, the *Tillandsia usneoides*, or "Spanish Moss" of the southern portion of the Atlantic slope of the United States, is, however, often found attached to the smooth bark of the orange tree along the shores of the Gulf of Mexico, and has even been known to live and increase in bulk when blown across a telegraph-wire; but careful experiments, made by hanging plants where they can certainly get little but what they receive from the atmosphere, and by putting others in decomposing wood in a hanging-basket, show by the largely increased luxuriance of the plant that it does derive great advantage from this kind of nutriment; and we have no reason to believe that there is such a thing as a genuine air-plant in nature, at least outside of microscopic organisms.

The epiphytal Orchideæ are in immense numbers in tropical countries, from whence the beautiful forms under culture are received. In the northern part of Europe expensive greenhouses are built and much intelligent skill is employed in order to grow them successfully. In the warmer parts of the United States many of them are grown successfully by hanging the blocks or baskets in which they are growing under arbors or on blocks of trees in the open air in summer, and keeping them in cool greenhouses in many cases, or warm greenhouses in others, during the winter season. Only two species are found naturally in the United States—*Epidendrum conopseum* and *E. venosum*, which occur in Florida.

There are some half dozen species of *Bromeliaceæ* in the warmer parts of the Atlantic slope, of which the best known is the *Tillandsia usneoides*, the long gray plant known as "Spanish Moss." This is found in small quantities as far north as the Dismal Swamp in Virginia. An additional proof that it is not wholly an air-plant, but derives some of its sustenance from vege table matter, is, that it has evidently a choice in the trees to which it attaches itself. It seems particularly to enjoy life on the live-oak, *Quercus virens*, and the deciduous or bald cypress, *Taxodium distichum*. It hangs from these in dense masses, often a yard long. It is found in less luxuriance on many other trees, but the writer of this has never been able to find one case of growth on a pine tree or to hear of an instance from others.

It takes its name, *usneoides*, from its great resemblance to the *Usnea*, a gray lichen which hangs, often a foot long, from trees farther north. It is a very useful plant. Bedded in the earth, the cellular matter is rotted away, and the fibre which remains is almost as good as hair for stuffing mattresses, sofas, and chairs, and a considerable amount of industry in the districts where it abounds is occupied in preparing it for market. It is also an excellent material for packing fruits, as it has no disposition to heat, as so many other vegetable substances have. (T. M.)

AIRY, Sir George Biddell, K. C. B., F. R. S., English astronomer-royal, was born at Alnwick, Northumberland, June 27, 1801. He was educated at private schools, then at Colchester Grammar School, and in 1819 entered Trinity College, Cambridge. He graduated in 1823, being senior wrangler, and was elected a fellow of his college in the next year. After obtaining his degree of M. A. he was elected in 1826 to the Lucasian professorship, which had formerly been held by the renowned Barrow and Sir Isaac Newton, but had long been a sinecure. Prof. Airy soon began a course of public lectures on experimental philosophy, which he continued till 1836. In these lectures the undulatory theory of light was first fully explained and adequately illustrated. In 1828 he was elected Plumian professor, and was entrusted with the entire charge of the Cambridge Observatory. The improvements which he made in methods of calculation and the publication of observations, as shown in his *Astronomical Observations* (9 vols., 1829–38), have since been adopted at Greenwich and other observatories. In 1835 he was selected by Lord Auckland, president of the Board of Admiralty, to succeed Mr. John Pond in charge of the Royal Observatory at Greenwich. His services in this important position have been highly beneficial to his nation and to the cause of science. Among the new instruments which he introduced were the altazimuth, the water-telescope, the transit-circle, and the large equatorial erected from his plans in 1859. Under his superintendence also the methods of calculation have been greatly improved, so that the results of the observations are promptly available. The investigations have been extended to magnetism, meteorology, solar photography, and spectroscopy. Nor has he confined his attention to the sciences immediately allied with astronomy. He has taken an active interest in other departments, and has frequently been consulted by the Government on scientific questions of general interest. In 1834, when the former national standards of weights and measures had been destroyed in the fire which consumed the Parliament House, Mr. Airy was chairman of the commission to construct new standards. He has advocated the establishment of a decimal coinage, and has recommended the adoption in Great Britain of the railroad gauge of four feet eight inches, instead of six feet. In 1838 he investigated the disturbance of the compass in iron ships, and devised means to correct the irregularity. The preliminary astronomical observations necessary to fix the boundary between the United States and Canada were conducted under his direction, and he aided in tracing the North-western boundary also. He caused special experiments to be made with a pendulum in the Harton mine, near South Shields, for the purpose of determining the weight of the earth and illustrating the theory of gravitation. Ancient chronology has been aided by his computation of the exact time of several of the most important eclipses on record. For the purpose of observing the solar eclipses he has made three visits to the Continent: in 1842 he went to Turin, in 1851 to Göthenburg, and in 1868 organized the scientific expedition to Spain, called, from the ship in which it sailed, the Himalayan expedition. In 1874 he had entire direction of the British observations of the transit of Venus, the results of which were reported in 1877. He has recently given much attention to the lunar theory, in regard to which he has proposed a new method. His career, while not marked with any brilliant discoveries, has been eminently useful, laborious, and honorable. He has done much to diffuse a general knowledge of science, contributing to the *Penny Cyclopædia* an article on "Gravitation" (also published separately); to the *Encyclopædia Metropolitana* articles on "Astronomy," "Trigonometry," "Figure of the Earth," and on "Tides and Waves." He has also published *Mathematical Tracts*, *Lectures on Astronomy*, treatises on *Sound*, *Magnetism*, and on *Errors of Observation*. He has also contributed to the *Cambridge Transactions*, *The Philosophical Transactions*, *Memoirs of the Royal Astronomical Society*, and the *Philosophical Magazine*. His contributions to the *Athenæum* have generally been signed A. B. G. He has taken an interest in antiquarian subjects, and in 1865 published *Essays on the Invasion of Britain by Julius Cæsar*.

The value of his labors has frequently been recognized by learned societies, British and foreign, from which he has received numerous medals and other marks of honor. The University of Oxford has given him the honorary degree of D. C. L., and Cambridge that of LL.D. He was made a knight commander of Bath, July 30, 1872. For two years he was president of the Royal Society, resigning in 1873.

AIVAZOVSKI, Gabriel, a learned Armenian author, was born at Theodosia, in the Crimea, May 22. 1812. and descended from the ancient family of Aïvaz or Haïvaz, established for more than two centuries in Galicia. In 1826, when fourteen years of age, he entered the convent of the Mekhitarists at Venice. After taking orders he was appointed, in 1843, professor of European and Oriental languages, of philosophy, and theology in his college of St. Lazarus. In 1848 he took the position of prefect of studies in the Armenian college of Samuel Moorat, near Paris. A schism arising in the Mekhitarist community, he advocated the principle of nationality in opposition to that of Ultramontanism. In consequence he resigned his position, and afterwards founded the new Armenian college of Grenelle, near Paris. He is a member of the Historical Institute of France, of the Asiatic Society, of the Institute of Oriental Languages of Moscow, etc. He has published a *Summary of Russian History*, in Armenian (Venice, 1836), and a *History of the Ottoman Empire*, also in Armenian (1841). For six years he conducted an Armenian literary and scientific review, the *Pazmaveb*, issued from the Armenian convent of Venice, and was one of the principal aids of Jean Baptiste Aucher in the publication of his *Grand Dictionary of the Armenian Language*. Among his other works may be noted an *Armenian Atlas* and an Armenian-French review, the *Colombe du Massis* (Paris, 1855).

AKERS, Benjamin Paul (1825–1861), an American sculptor, was born at Saccarappa, near Portland, Me., July 10, 1825. After working for some time in a printing-office at Portland, he turned his attention to sculpture. In 1849 he opened a studio and made busts of Longfellow and others. In 1851 he went to Italy, and upon his return modelled the statue of Benjamin in Egypt. He returned to Italy in 1855, and resided there for three years, during which time he produced Una and the Lion, St. Elizabeth of Hungary, and the Dead Pearl-diver. He returned to America with impaired health, but revisited Rome in 1859. He died at Philadelphia, May 21, 1861. Hawthorne, in his *Marble Faun*, has elaborately described some of his works.

ALABAMA, a Southern State of the American Union. The popular etymology of the name, which interprets it as meaning "Here we rest" in the dialect of its aboriginal inhabitants, although adopted by some respectable modern writers, has no sufficient authority to sustain it, and is probably purely fanciful. The name was really derived from an Indian tribe called by the early French colonists *Alibamons* or *Alibamous*. (See ALABAMA INDIANS.)

See Vol. I. p. 388 Am. ed. (p. 438 Edin. ed.).

State Seal of Alabama.

Alabama extends through nearly five degrees of latitude (35° to 30° 13′ N.), from Tennessee on the north to the Gulf of Mexico on the south—a length of about 331 statute miles—and from Georgia on the east to Mississippi on the west, the extremes of longitude being the meridians of 84° 53′ and 88° 35′ W., and the maximum width from east to west about 202 statute miles. The continuity of these boundaries is interrupted by a strip of the State of Florida, some 50 or 60 miles in average breadth, which intervenes between the gulf and the interior of Alabama for three-fourths of the width, from east to west, of the latter State, leaving it only about fifty miles of sea-coast in direct extent. This includes, however, the important Bay of Mobile with its sinuosities and affluents.

Natural Divisions—With regard to its characteristic natural features, Alabama consists of four divisions, widely differing from each other in soil, surface, climate, and productions. I. *The Valley of the Tennessee River*, which occupies the northern and north-western part of the State. This is a rich agricultural region, chiefly of mountain-limestone or sub-Carboniferous formation. The eastern part of this division, approaching the mountains of the Appalachian chain, is hilly and broken; elsewhere it is in general undulating or level. The climate is temperate and healthful. —II. *The Mountain and Mineral Region*. The mountains of the great Appalachian range enter the State at its north-eastern corner, and extend in a south-westerly direction into the interior under various local names, becoming gradually depressed in height until they terminate in the hills of Central Alabama. These widen in extent as they diminish in elevation, and occupy the greater part of the breadth of the State in its northern-middle part. The geological structure of this division is chiefly Silurian and Carboniferous, including also part of a large Metamorphic area, which occupies the middle-eastern part of the State. The vast coal-measures found in the midst of the mountain-ranges, and extending to the westward of them, are estimated as covering an area of 5500 square miles. Immense deposits of iron are found in various parts of this section of the State. The soil is generally poor, except in some of the valleys and near the banks of the larger streams. The climate is liable to considerable changes of temperature, but free from malaria and very healthful.—III. *The Agricultural Region*. This is a tract extending across the State immediately south of that just described, and generally from sixty to eighty miles in width. Its outline is irregular, curving to the northward in a wedge-shaped projection on the west, but chiefly lying between the parallels of 33° and 31° 40′, north latitude. Geologically, it is of the Cretaceous formation, with the exception of a section of the Metamorphic area already mentioned in its north-eastern part, and a strip of superficial "Drift" running along its northern border. With these parts excepted, it constitutes what is generally known as the "Black Belt"—so called, perhaps, from the prevailing character of the soil, or more probably from the predominance of the negro population. The "Black Belt" is the great cotton-growing region. It is exceedingly productive, but water is scarce in many parts of it in seasons of drought, and miasmatic diseases prevail in summer and autumn. The scarcity of water is partially supplied by artesian wells. In the western part of this division lie the celebrated "prairie"-lands, of unsurpassed fertility. The term "prairie," however, is not applied to them exclusively in its proper sense of a natural meadow, but is locally employed to designate all lands having the peculiar *soil* ("rotten limestone") observed in the true prairie, whether open or woodland. Hence the use, believed to be peculiar to this region, of the distinctive expressions "bald prairie" and "wooded prairie," the one seeming to a stranger pleonastic, the other paradoxical. —IV. *The Forest or "Piny Woods" Region*. This comprises all of the State lying south of the division just described. It is a portion of the great belt of country adjacent to the northern shore of the Gulf of Mexico east of the Mississippi Valley, extending inland for a distance of 100 to 150 miles, and known as the "piny woods" from the long-leaved or yellow pine (*Pinus australis*), which is the most conspicuous and universal product of its forests. Geologically, it is of Tertiary formation, but overspread throughout its whole extent by a covering of arenaceous Drift. The statement usually made, that this section of the State is flat and but slightly elevated above the sea-level, applies only in those strips of territory immediately contiguous to the coast or the larger rivers. The greater part of the country is either gently undulating or even hilly and broken. Some of the ridges in Mobile and Baldwin counties, which occupy the south-eastern corner of the State and comprise its whole sea-coast, have an elevation of from 100 to 300 feet. The soil is in general sandy and naturally barren, but readily susceptible of artificial fertilization. The climate is singularly healthful and pleasant. It is less liable to extremes of temperature and to sudden changes than that of the interior. The summers are longer, but less oppressive, than those of higher latitudes, and are tempered near the coast by almost perpetual breezes. Except in the alluvial valleys of the principal rivers there is no miasma. Fevers of local origin and malarial diseases of all kinds are almost unknown outside of the cities and larger towns, of which there are few. The beneficial effects of the atmosphere of the pine forests in the relief of pulmonary diseases are well known. Dr. Charles Mohr, an eminent botanist, attributes the uniformity and moderation of the temperature to the same cause. "To this fact," he says, "is due the delightful climate of this part of our country, equalizing its temperature, particularly in tempering the rigors of the long summers of a region near the tropics. During the great progress of meteorological science of late years the fact has been established that, in their exercise upon the conditions of the atmosphere, as regards the precipitation of its moisture, the pine trees stand unrivalled amongst all other trees of the forest." The great abundance of springs and small streams of pure water is another characteristic feature of this region. The ordinary range of temperature during the winter proper is from 30° to 70° Fahr.; during the summer months, from 73° to 94°; in the intermediate seasons, from 42° to 85°; the mean annual temperature is about 66°. The *exceptional* extremes noted during observations continued for more than thirty years have been 14° and 99°. The *daily* range rarely exceeds 20°. The lack of trustworthy and continuous observations renders it difficult to give exact figures with regard to the temperature of the other sections of the State. The range of the thermometer, both annual and diurnal, is greater than in the region last described, and of course the average is lower. The mean annual temperature of the whole State has been estimated at 61°, which is possibly somewhat too high.

The greater part of Alabama is drained by the affluents of the Mobile River, which is formed by the junction of the Alabama and Tombigbee, and flows into the Bay of Mobile after a course of only 50 miles. A lateral outlet, the Tensas, runs parallel with it on the east for the greater part of this course, and reunites with it at its mouth. The Alabama is formed by the union of the Coosa and Tallapoosa, both of which have their sources in the north-western part of Georgia. (See ALABAMA RIVER.) The navigation of the Coosa from Wetumpka, 10 miles above its mouth, to Greensport (137 miles), is impeded by a series of shoals, but is resumed at Greensport, from which steamers run to Rome, in Georgia, 180 miles farther. The Tallapoosa is not navigable. The Tombigbee rises in the north-eastern part of Mississippi, receiving from the eastward, after its entrance into Alabama, its chief tributary, the Black Warrior. It is navigable in favorable seasons as far as Cotton Gin Port, in Mississippi, 480 miles, and the Warrior as far as Tuscaloosa, 413 miles, from the mouth of the Mobile. The Tennessee River, which waters the northern part of the State, is open to navigation throughout this portion of its course (about 240 miles), except where it is obstructed, for 40 miles, by the Muscle Shoals. Steamboats ascend the Chattahoochee, which forms part of the eastern boundary of the State, as high as Columbus, Ga., 350 miles, by the course of the river, from its mouth. Among the smaller rivers are the Cahaba, a tributary of the Alabama, the Choctawhatchie, Yellow, and Escambia, with its tributary the Conecuh (properly the main stream), which flow through West Florida into the Gulf of Mexico; and the Perdido, which, with its estuary, Perdido Bay, constitutes the dividing-line north and south between Alabama and Florida.

Mobile Bay, the only considerable arm of the sea within the limits of this State, is about 30 miles in length from the mouth of Mobile River to the gulf, 3 miles in width at its entrance, 22 miles in its greatest width, and admits vessels drawing twenty-two feet. Dauphine and Petit Bois islands, near the entrance of Mobile Bay and extending several miles westward, are parts of Alabama.

Natural History.—Besides the immense pine forests characteristic of the southern part of the State, the same section furnishes, in its lowlands, gigantic cypress trees, the juniper, live-oak, water-oak, water-ash, magnolia, sweet bay, black gum, etc.; and in higher spots, especially where the pines have been felled, a variety of species of oak, with other hard woods. "The grand and sober monotony," says Dr. Mohr, "that characterizes the pine forest finds a pleasant relief in the thickets and glades of evergreen shrubs and various smaller trees which fringe the water-courses and swamps." Among these he enumerates the red and sweet bays, wax-myrtle, illicium, yellow jessamine, wistaria, yupon, azalea, blueberry, calycanthus, and a multitude of other species. Passing northward to the Cretaceous and Metamorphic formations of the agricultural zone, we find the prevailing evergreens of the more southern belt replaced by a deciduous growth of oaks of various species, intermingled with the ash, elm, walnut, and hickory. The long-leaved pine disappears, except in the barren ridges and hills, to reappear, however, in the narrow belt of Drift already mentioned, which extends from north-west to south-east between the Cretaceous and Palæozoic formations. Beyond this belt, again, in the Metamorphic region, it yields place to the short-leaved yellow pine. "The more sterile and broken mountainous country east and west, embracing the mineral lands of the State, is covered with dense forests of black and red oaks and the smooth hickory, sparsely intermixed with scrub pines. In the more elevated ranges the mountain chestnut-oaks and the chestnut tree prevail, the latter rapidly dying out" (*Mohr*). Among the trees of the Tennessee Valley, in addition to the oak, hickory, elm, and walnut found in other parts of the State, the same authority just cited mentions the beech, maple, nettle tree, umbrella tree, cucumber tree, and white poplar or tulip tree.

Deer, turkeys, squirrels, and other wild animals abound in some parts of both the mountain and the forest regions. Bears are occasionally found in the canebrakes and swamps of the South. The smaller species of game frequent all parts of the State, many of them being most abundant in the vicinity of cultivation.

Mineral waters are found in all the great geological districts of the State, except perhaps the Metamorphic. The most noted of these are—(1, in the sub-Carboniferous region of the Tennessee Valley), Bailey Springs in Lauderdale county, near Florence; (2, in the Silurian district), Blount, St. Clair, and Talladega Springs in the counties of the same names, respectively; (3, in the Cretaceous formation), the Livingston artesian well in Sumpter county; (4, in the Tertiary), Bladon Springs in Choctaw county, Jackson Springs in Clarke, and the Healing Springs (lately discovered) in Washington.

Many mounds and other remains of aboriginal antiquity of great interest are found in various parts of the State. Among the most remarkable of these is a vast "shell-bank," of artificial origin, in Mobile county, on the coast. It covers a space of six or seven acres, and consists almost exclusively of oyster-shells, of which it is estimated to have contained a million and a half bushels. Many human bones and relics of pottery have been exhumed from it.

Clarke county, which occupies the "fork" between the Alabama and Tombigbee rivers, is famous for its fossil remains of the Tertiary period. One of the most remarkable of these is the greater part of the skeleton of a zeuglodon, discovered in 1843, measuring 70 feet in its entire length. It is preserved in a private collection in Boston.

Resources and Products.—The great coal and iron deposits of the mineral region are as yet only in a state of incipient development, and estimates of their extent and value are to a great degree merely conjectural. Speaking of the iron, Prof. Eugene Smith, State geologist, says: "It is customary to speak of these accumulations of ore as *inexhaustible*, but the truth is, the extent of them is not at all known, except in a few instances. In those localities where the ore makes the greatest show on the surface it is not known how deep it extends. The pockets of ore seem to be entirely independent of the bedding of the rocks underlying them, and of comparatively recent origin—*i. e.*, in their present condition. For these reasons I think the term *inexhaustible* ought to be used with caution until as much is known of the actual thickness of the deposits as of their superficial extent." Notwithstanding this *caveat* against over-estimates, the enormous extent of the beds is admitted by all geologists and practical experts. What is known as the Red Mountain vein is said to be 100 miles in length, with a width varying from half a mile to a mile, and a thickness of about thirty feet where intersected by the South and North Alabama Railroad. "The most interesting and important feature in relation to this remarkable deposit of ore is its proximity to other materials necessary for its reduction. Both the coal and limestone lie parallel to it and separated by (only) a few miles throughout its entire length" (*Berney's Handbook of Alabama*).

This juxtaposition of the deposits of iron and coal furnishes a basis for the assertion that Alabama is the only part of the American continent where it is possible to produce iron in competition with the cheap iron of England. "The cheapest place until now on the globe for manufacturing iron," said Mr. Hewitt of New York in a public address a few years ago, "is the Cleveland region, in Yorkshire, England. The distance of the coal and the ore from the furnaces averages there about twenty miles. Now, in Alabama the coal and the ore in many places are within a *half mile* of each other. The Sandstone formation thins out towards the South, and in Tennessee and Alabama appears to be replaced by this fossiliferous iron ore, which commences in New York with a thickness rarely exceeding two feet, but steadily thickens towards the South, averaging four feet in Pennsylvania, seven or eight feet in Tennessee, while in Alabama, probably because the formation was crushed back upon itself in some way, there are places where the iron has been measured *one hundred and fifty feet* in thickness." The yield of the coal-mines of the State increased from 11,000 tons in 1869 to 340,000 in 1880. The product of pig iron was only 22,283 tons in 1872, but had increased to 49,811 tons in 1879, and to 77,190 in 1880. In 1881 there were fifteen furnaces in existence. Among other mineral products are copper, gold, lead, corundum, asbestos, graphite, and soapstone, but none of these have been developed to any profitable extent. Granite and slate for building purposes have been quarried in the Metamorphic region, and marble of excellent quality is found near Talladega. Lime is manufactured in various parts of the State, and rich beds of marl are found in the Cretaceous and Tertiary formations. During the late war, when the Southern ports were blockaded, salt was obtained in considerable quantities from beds in the south-western part of the State, but the working of these has ceased to be profitable.

Cotton is the great staple of Alabama, which, in respect of its production, stands fourth in rank among the States of the Union, being surpassed only by Mississippi, Georgia, and Texas, in the order named. It is cultivated to some extent in all parts of the State, though more than half of the crop is produced in the "Black Belt." Next in order of production is the Tennessee Valley. Comparatively little is grown either in the mineral or the "piny woods" region. The whole product of the State in 1879 (as shown by the census returns of 1880) was 699,654 bales. The crop of 1860 amounted to 989,955 bales, but political and social changes since that period have operated to reduce it. The next crop in extent and value is Indian corn, of which the product in 1879 was 25,451,278 bushels. In 1860 it amounted to 33,226,284 bushels. The smaller grains—excepting oats, of which the cultivation is general—are grown chiefly in the northern and north-eastern parts of the State. Of these the product in 1879 was, in bushels—wheat, 1,529,657; oats, 3,039,639; rye, 28,402; barley, 5281; and buckwheat, 363. The sweet potato is extensively cultivated throughout the State. The crop of 1860 amounted to nearly 6,000,000 bushels. In 1870 it had been reduced to about 2,000,000, but was still fourth in order among the crops of the States in general, being exceeded only by those of North Carolina, Georgia, and Texas, respectively. Tobacco and sorghum are cultivated to a limited extent in the northern, and rice and sugar-corn in the southern, parts of the State. The production of early vegetables for Northern markets is rapidly increasing on the small farms near Mobile. Most of the fruits of the temperate zone are produced in the northern part of the State. The county of Blount is said to be the best apple-growing county in America. The peach, pear, and grape thrive in both the northern and southern sections. Oranges and figs are abundant in the coast region.

The cotton manufactured in Alabama in 1880 employed 1060 looms and 55,072 spindles, gave occupation to 1600 persons, and consumed 14,887 bales of the raw material. The manufacture of lumber in the forest region near the coast has rapidly increased of late years, but exact statistics on the subject are not easily obtained. Manufactures of iron are in general confined to works for the reduction of the ore already mentioned. Grist-mills are employed chiefly in supplying the local demand. The minor miscellaneous manufactures have made but limited progress, on account of the lack of capital for investment in them.

The direct foreign commerce of Alabama, carried on through its only seaport, Mobile, has declined of late, chiefly on account of the construction of railroads, by which cotton (the principal article of export) is carried to the Atlantic ports or to New Orleans. Much of the coal product finds a market in the West, and the greater part of the exportation of hewn timber and sawed lumber is effected through Pensacola, Fla. The exports from Mobile, which in 1870 amounted in value to $22,422,631, had declined in 1878 to $9,126,634. The imports for the same years, respectively, were $1,349,488 and $1,148,442. The shipping of the State in 1881 consisted of 73 sailing vessels, with a capacity of 7937 tons; 44 steam vessels (chiefly boats for inland navigation), aggregating 7005 tons; and 4 barges, 349 tons; total tonnage, 15,290.

Railroads.—Several great lines traverse the State. (1) The Mobile and Ohio Railroad, extending from Mobile to Columbus, Ky., although only 61 miles of it lie within the State, is one of the most important to its trade, bringing a large share of the products of Mississippi and Tennessee to the terminus of the road at Mobile. (2) The part of the main line of roads controlled by the Louisville and Nashville company, passing through Alabama, consists of 27 miles of the New Orleans and Mobile, the Mobile and Montgomery (178 miles), the South and North Alabama (183 miles), and 26 miles of the Nashville and Decatur—altogether, 414 miles, making a great curve through the State from its extreme south-western corner to its northern boundary, with a branch leading to Pensacola, of which only a small fraction of a mile lies in Alabama. (3) The East Tennessee, Virginia, and Georgia, consisting of the Alabama Central division, from York (a station on the Great Southern near the western boundary of the State) to Selma, 87 miles, and the Selma, Rome, and Dalton, from Selma to Rome in Georgia—171 miles in Alabama; total, 258 miles. (4) The Western Railroad, consisting of the Selma division, from Selma to Montgomery, 45 miles, and the Western proper, from Montgomery to West Point, on the Georgia line, 88 miles; total, 133 miles. This road, in connection with the Alabama Central division of the East Tennessee, Virginia, and Georgia, forms a continuous line traversing the width of the State from east to west. (5) The Alabama Great Southern, connecting Chattanooga, Tenn., and Meridian, Miss., 244 miles of its whole length (295) lying in Alabama. (6) The Memphis and Charleston Railroad, running through the Tennessee Valley across the northern part of the State, in which lie 156 miles of its length. All the above-named roads constitute parts of great lines of "through travel" between the North-western and Southern, or the Atlantic and South-western, States. Other railroads are the following: The Montgomery and Eufaula, between the places named, 80 miles; the Mobile and Girard, to connect Mobile with Girard on the Chattahoochee, opposite Columbus, Ga., completed only from Girard to Troy, in Pike county, 83 miles; the Mobile and Alabama Grand Trunk, to run from Mobile to Birmingham, but constructed for only 56 miles from Mobile, and not now in operation; the Cincinnati, Selma, and Mobile, completed only from Selma to Greensboro, 43 miles; the Columbus and Western, completed for 87 miles in a north-westerly direction, from Girard, through the counties of Lee, Chambers, Tallapoosa, and Coosa; the East Alabama, built in a northerly direction for 25 miles from Opelika through the counties of Lee, Chambers, and Etowah; the Montgomery Southern, completed for only 8 miles from Montgomery; the New Orleans and Selma, in operation for 20 miles south-westerly from Selma; the Pensacola and Selma, intended to connect Selma with the Pensacola branch of the Mobile and Montgomery road, 68 miles constructed; the Nashville, Chattanooga, and St. Louis, with 24 miles in Alabama, north-westerly from Stevenson in Jackson county; the Vicksburg and Brunswick, completed for 21 miles from Eufaula to Clayton, both in Barbour county; and the Tuskegee Railroad, 6 miles in length, connecting the village of Tuskegee, in Macon county, with the Western Railroad. Whole length of railroads, 1787 miles, besides 132 miles of side-track. The value of these roads, according to the State auditor's report for 1881–82, was $15,801,829.78; value of rolling-stock, $1,772,753.89; total, $17,574,583.67.

Alabama at present (1883) has 66 counties. The population in 1820 (the year after its admission as a State of the Union) was 127,901; in 1830, 309,527; in 1840, 590,756; in 1850, 771,623; in 1860, 964,201; in 1870, 996,992. In 1880 the population was 1,262,505, of whom 662,185 were white, 600,103 colored (African and mixed), 213 Indians, and 4 Chinese. The principal cities and towns are—Mobile, with a population in 1880 of 29,132; Montgomery, the seat of government, 16,714; Selma, 7529; and Huntsville, 4977. Other considerable towns are—Eufaula, Greenville, Marion, Opelika, Florence, Talladega, Birmingham, Greensboro, Tuscaloosa (formerly the State capital), Demopolis, Union Springs, Tuscumbia, Wetumpka, Troy, Cullman, etc.

The entrance to the Bay of Mobile is defended by Fort Morgan on the east and Fort Gaines (on Dauphine Island) on the west. The Mount Vernon Arsenal is in Mobile county, about 30 miles north of the city of Mobile. Of public State institutions the most notable are—the University of Alabama at Tuscaloosa, the insane hospital at the same place, the agricultural and mechanical college at Auburn (in Lee county), the institution for the deaf and dumb and the blind at Talladega, the medical college at Mobile, and the State penitentiary at Wetumpka. There are four normal schools—at Florence, Tuskegee, Huntsville, and Marion respectively. Of these, the first two are for the benefit of white, the other two for that of colored, pupils. Spring Hill College, near Mobile, is a Roman Catholic institution; Howard College, at Marion, belongs to the Baptists; and the Southern University, at Greensboro, to the Methodist Episcopal denomination.

History.—The first European settlement of Alabama was made by the French, who in 1702 removed their colony from Biloxi Bay (where it had been planted in 1699) to a spot on the Mobile River about 20 miles above the present site of Mobile, where they erected a fort and gave it the name of St. Louis de la Mobile. Dauphine Island was occupied, and a depôt for supplies established there, about the same time. These settlements were the origin of the great province of Louisiana, of which Lemoyne de Bienville, the founder of Mobile, and afterwards of New Orleans, was then the governor. St. Louis de la Mobile having been overflowed by a storm or freshet, the colony was removed in 1711 to the site of the present city of Mobile. Fort Toulouse was built in 1714 at the confluence of the Coosa and Tallapoosa rivers. The seat of government of Louisiana was transferred in 1719 or 1720 to Biloxi, and in 1723 to New Orleans. Mobile, however, with the adjacent settlements, continued to be an important part of the province until the Treaty of Paris in 1763, by which all of Louisiana east of the Mississippi (except the small insular or peninsular district south of Bayou Manchac, the Amite River, and Lakes Maurepas, Pontchartrain, and Borgne) was ceded to Great Britain. The rest of the province was transferred to Spain, Spain at the same time relinquishing Florida to Great Britain. The British Government extended the limits of West Florida to the Mississippi River on the west and to lat. 32° 28′ on the north, so that all the settled portion of what is now Alabama became part of West Florida. War having again broken out between Spain and Great Britain, Mobile was captured by the Spanish governor Galvez of Louisiana in 1780; and in 1783, by the Treaty of Versailles—the same that recognized the independence of the United States—the Floridas, both East and West, were retroceded to Spain. Ambiguities and obscurities in the terms of this treaty left it doubtful whether the northern boundary of West Florida was the parallel of 31° or of 32° 28′, north latitude, and this question led to much contention between Spain and the United States, further complicated by a claim set up by the State of Georgia to the disputed territory between those two parallels. The question, as between Spain and the United States, was settled by the surrender of the Spanish claim by the Treaty of Madrid, 1795. The claim of Georgia was relinquished in 1802 for a pecuniary equivalent paid by the United States. Meantime, the district in dispute had already been organized by Congress, in 1798, as the Territory of Mississippi.

Louisiana having been re-transferred by Spain to France, and immediately afterwards sold by France to the United States, in 1803, another question of boundaries arose. The United States claimed that the cession by Spain to France and the sale by France to the United States included all of Louisiana *with its original boundaries*, extending to the Perdido River on the east. Spain, on the other hand, contended that the province purchased by the United States was Louisiana with the limits as understood for forty years prior to the purchase. Hence the strip of territory south of the parallel of 31° N., from the Mississippi to the Perdido, was claimed by both parties. The Spanish authorities were in possession, but in 1810 the disputed territory, as far east as the Pascagoula River, was seized by the Anglo-American inhabitants, who set up a government of their own, and in 1813 Mobile was forcibly occupied by Gen. Wilkinson, acting in behalf of the United States, thus wresting the remainder of the district in dispute from the hands of the Spaniards. The question was not finally settled, however, until the treaty of 1819, by which all the Spanish possessions east of the Mississippi were ceded to the United States.

The war of 1813–14 with the Creek or Muscogee Indians began with the battle of Burnt Corn, fought on the 27th of July, 1813, within the limits of the present county of Conecuh, followed by the bloody massacre of Fort Mims, in the northern part of what is now Baldwin county, on the 30th of August. The Indians were defeated by Gen. Andrew Jackson with great slaughter at Talladega on the 9th of November, and again, after several minor engagements, at the Horseshoe Bend, now in the county of Tallapoosa, on the 27th of March, 1814. This battle virtually ended the war, and peace was formally concluded on the 19th of the ensuing August, with a large cession of territory by the Creeks. Extensive cessions had already been made, from time to time, by the various tribes, but the Indian titles were not fully relinquished for many years afterward.

Meantime, the Mississippi Territory, after the Georgia cession, had been extended northward to the Tennessee line. In 1817 the western part of it had been cut off and admitted into the Union as the State of Mississippi. The remainder, constituting the State of Alabama, was organized and admitted into the Union in 1819. The first State legislature assembled at Huntsville in October of that year. The seat of government was removed to Cahaba in 1820, to Tuscaloosa in 1826, and to Montgomery in 1847.

Alabama was the fourth State to withdraw from the Union, her ordinance of secession having been adopted on the 11th of Jan., 1861. The provisional Congress of delegates from the seceded States—then only six in number—met in Montgomery on the 4th of February ensuing, and organized a government by the adoption of a provisional constitution on the 8th. Jefferson Davis was inaugurated as President on the 18th, and Montgomery continued to be the seat of government for the Confederate States until it was transferred to Richmond in May ensuing. But few military operations of any magnitude occurred in Alabama during the first three years of the war. The Tennessee Valley was occupied in the spring of 1862 by the Federal troops, who retained possession in general of the part of the State north of that river until the close of the struggle, but failed to obtain a permanent foothold south of it. An arsenal and foundry established at Selma furnished large supplies of arms and ammunition to the Confederate forces. A navy-yard was organized at the same place, at which the celebrated iron-clad ram Tennessee and several gunboats were constructed. The exigencies of the war also gave an impetus to the development of the iron-mines of the State, some of the ores being found admirably adapted to the manufacture of ordnance.

On the 5th of Aug., 1864, the powerful fleet of Admiral Farragut, consisting of 18 vessels, succeeded in passing the guns of Forts Morgan and Gaines, and entered the Bay of Mobile with the loss of one vessel. A warm engagement ensued with the Confederate fleet, consisting of the ram Tennessee and three wooden gunboats, which were all eventually captured or driven up the bay. The forts were both reduced a few days afterward. In the spring of 1865, Alabama was rapidly overrun and reduced by the combined operations of an army of 45,000 men in the south, under Gen. Canby, and a large cavalry force, under Gen. J. H. Wilson, advancing simultaneously from the north. Selma was carried by assault by Wilson on the 2d of April. The arsenal, navy-yard, foundry, and other public property were destroyed. Tuscaloosa was captured by a detachment under Brig.-Gen. Croxton on the 3d, and the university buildings and library burned. Spanish Fort, near the head of Mobile Bay, was taken by Canby's troops, after evacuation by its garrison, on the 8th of April, and Blakely, a few miles above, was stormed and the garrison captured on the 9th. Mobile, having been abandoned by the Confederates after the reduction of these two forts, was occupied on the 12th. Gen. Wilson took possession of Montgomery on the same day. On the 4th of May the military department of which Alabama was a part was surrendered by Gen. Taylor, its commander, to Gen. Canby, at Citronelle, a small village on the Mobile and Ohio Railroad, 33 miles from Mobile. This capitulation virtually ended the war.

On the 21st of June, 1865, Lewis E. Parsons was appointed provisional governor of the State by Pres. Johnson. Delegates were elected to a State convention which assembled in September, and certain alterations in the State constitution were made to adapt it to the changed conditions. A State legislature was convened, and U. S. Senators and Representatives were elected. These last, however, were denied admission to their seats by the then existing Congress, which refused to recognize the validity of the action of the President. After a long struggle on the subject between the President and Congress, the Reconstruction Act of 1867 was passed, under which the State became part of a military district, to the command of which Gen. Pope was appointed. The act had also made provision for the termination of military government by the call of State conventions and the formation and adoption of new constitutions under certain conditions and restrictions. One of these was that any constitution adopted by the convention should be submitted to a popular vote and require a majority of *all* registered voters to ratify it. The constitution drawn up by the Alabama convention was objectionable to a large class of the people, who defeated it by abstaining from the polls, thus hindering it from obtaining the required majority. Congress nevertheless declared it adopted, and it continued in force until superseded by the present constitution, which was framed in 1875 by a convention of autonomous origin and creation by the people of the State.

Government.—Under the present constitution the general assembly consists of a senate of not more than 33, and house of representatives of not more than 100, members. The senators are elected for four, and representatives for two, years. The pay of members of both houses is $4 a day and 10 cents for each mile of necessary travel. The sessions are held once in two years, and cannot last longer than fifty days.

The executive department consists of a governor, secretary of state, treasurer, auditor, attorney-general, and superintendent of education, each elected for two years, and a sheriff in each county, elected for four. The governor has a qualified veto-power upon any bill passed by the legislature or any item of an appropriation bill. In case of his disapproval of any such legislation, it fails to become valid, unless re-passed by a majority of the whole number of members elected in each house, in which case it becomes law, even without his consent. The salary of the governor is $3000 a year; of the superintendent of education, $2250; treasurer, $2100; secretary of state and auditor, each $1800; attorney-general, $1500. Sheriffs are paid by fees and commissions.

The judicial department consists of the senate when sitting as a court of impeachment, a supreme court, chancery, circuit, and probate courts, and such inferior courts as the general assembly may find it expedient to create. Justices of the peace and some notaries public are also invested with limited judicial functions. The supreme court consists of a chief justice and such number of associate justices as may be prescribed by law—two at present. The number of circuits and chancery divisions is also regulated by the legislature. There are now (1883) nine circuits and three chancery divisions. There is a judge of probate for each county. All these are elected for a term of six years by the qualified voters of the State or parts of the State respectively over which their jurisdiction extends. Their compensation is prescribed by law. At present the justices of the supreme court receive a salary of $3000 each; the chancellors and circuit judges, $2250. The judges of probate are paid by fees. The clerk of the supreme court and registers in chancery are appointed by the judges of the supreme court and chancellors respectively; clerks of the circuit courts are elected by the people of the respective circuits for a term of six years. Solicitors for each circuit are chosen by the general assembly for the term of six years. The provisions relating to inferior and county offices are similar in general to those of other States of the Union.

Residence in the State for twelve, and in the county for three, months is requisite for the exercise of the right of suffrage, which is forfeited also by conviction of treason or certain felonies. A homestead not exceeding $2000 in value, and personal property to the value of $1000, are exempted from execution. Taxation for State purposes must not exceed three-fourths of 1 per centum on the value of taxable property. Counties and municipal corporations respectively are prohibited from levying taxes exceeding one-half of 1 per centum on the value of taxable property, except in certain specified cases. No new debt can be incurred by the State, except to repel invasion or suppress insurrection, but "temporary loans" may be negotiated in case of necessity, never to exceed an aggregate of $100,000 in amount. A poll-tax may also be levied for the support of public schools, not to exceed $1.50 on each poll. Public schools are to be established for the equal benefit of all children from seven to twenty-one years of age, but separate schools are to be provided for "the children of citizens of African descent." Lotteries and gift enterprises are prohibited. Such are some of the more important provisions of the constitution.

Under the laws of Alabama the separate estate of the wife, whether acquired before or after marriage, is protected from liability for the debts of the husband, and the husband is not liable for debts of the wife contracted before marriage. A married woman may dispose of her separate estate, real or personal, by will. Real estate sold under execution, mortgage, or decree, is redeemable for two years under certain conditions. The legal rate of interest is 8 per centum. The railroads of the State are subject to the regulation and control of a board of commissioners, three in number, appointed by the governor, of whom the president receives a salary of $3500, the other two each $3000. The penitentiary is controlled by a board of three inspectors. The chief executive officer is the warden, who has a salary of $2000, and is directly responsible to the board of inspectors for the internal management of the institution.

Statistics.—The valuation of taxable property in Alabama for six consecutive years, beginning on Oct. 1, 1876, and ending on Sept. 30, 1882, was as follows:

1877		$135,535,790.00
1878		130,799,138.57
1879		126,773,262.85
1880		123,757,072.85
1881		139,077,328.22
1882	real estate, $85,087,757.08 personal, 67,792,312.16	152,880,069.24

The personal property included, among other items (although the returns from some counties are confessedly imperfect), 203,397 horses and mules, valued at $10,955,912.84; 227,171 head of horned cattle, $1,609,257; 45,044 hogs, $56,181.78; 150,160 sheep, $237,921.10; 62,161 goats, $39,954.10; farming implements, $86,721.25; mechanical tools, $360,954.50; wagons and other vehicles, $1,088,725.25; household and kitchen furniture, $882,430; jewelry, plate, etc., $179,665.50; musical instruments, $411,285.90; printing-presses and other materials, $100,155; guns, pistols, dirks, etc., $474,709; clocks, watches, etc., $757,662.50. Government property, the property of municipal, religious, charitable, scientific, and literary corporations, family portraits, the libraries of all clergymen and all other except professional libraries, also a certain allowance of household and kitchen furniture, cattle, farming and mechanical tools, to each person or family, are exempt from taxation, and therefore presumably not included in these returns. If added, they would largely enhance the aggregate value of property—especially of personal property—in the State.

The receipts and expenditures of the public treasury for the six years prior to Sept. 30, 1882, were as follows:

	Receipts.	Disbursements.	
Balance in treasury Oct. 1, 1876			$91,569.49
1877	$979,592.21	$880,604.06	
1878	942,998.61	872,867.48	
1879	931,289.16	927,323.08	
1880	930,601.25	844,649.09	
1881	964,741.78	874,174.61	
1882	1,012,547.01	918,588.61	
Balance in treasury Oct. 1, 1882			535,132.58
Total bonded debt of the State at the same date was			9,407,800.00

The rate of taxation for the first of the years above specified was 7½ mills on the dollar; for the next three, 7 mills; for the last two, 6½ mills.

The whole cost of the public schools of Alabama for the year ending Sept. 30, 1882, was $403,601.98. Of this amount there was paid to teachers of white schools, $222,996.38; of colored schools, $152,890.43; for salaries of county and city superintendents, $11,578.57; to normal schools, $15,500; and for contingent expenses, $636.60. The whole number of children of the school-age (seven to twenty-one years) enumerated was 401.002. of whom 224.464 were white and 176.538 colored. The pupils enrolled in white schools were 107,949; in colored schools, 69,479—total, 177,428. In the white schools 1874 male and 1182 female teachers were employed—total, 3056; in the colored schools, 1064 male and 444 female teachers—total, 1508. Whole number of teachers, 4564. The average monthly pay of teachers of white schools was $21.52; of colored, $21.88. The average amount paid each teacher during the year was $87.34. The number of white schools taught was 3058, with an average duration of 80 days; of colored, 1566, with an average duration of 78 days. The average daily attendance in white schools was 67,381; in colored, 47,146.

Further information may be obtained from Brewer's *Alabama* (Montgomery, 1872); Berney's *Handbook of Alabama* (Mobile, 1878): Pickett's *History of Alabama* (Charleston, 1851); Meek's *Romantic Passages in South-western History* (Mobile, 1857); Monette's *Valley of the Mississippi* (New York, 1846); Bartram's *Travels* (Philadelphia and London, 1791 and 1792); La Harpe's *Journal Historique* (republished New Orleans and Paris, 1831); *Histoire de la Louisiane*, by Le Page du Pratz (Paris, 1758); Dumont's *Mémoires Historiques sur la Louisiane* (Paris, 1753); Andrews' *Campaign of Mobile* (New York, 1867); French's *Historical Collections; Geological Reports*, by Profs. M. Tuomey and Eugene A. Smith; etc., etc., etc. (W. T. W.)

ALABAMA, a river in the State to which it gives name, formed by the confluence of the Coosa and Tallapoosa near the centre of the State. From this point it flows in a very tortuous but generally south-westerly course through a rich cotton-producing region, for about 350 miles, until it unites with the Tombigbee to form the Mobile River. Its width is in general from 200 to 300 yards, and its depth at ordinary low water from 3 to 7 feet. It is navigable in winter and spring throughout its whole course for large steamboats, and at all seasons for those of light draught. Its only considerable affluent, besides the two rivers above mentioned as forming it, is the Cahaba. Montgomery and Selma are both situated on its banks.

In many places the banks of the Alabama rise to the elevation of "bluffs" of great height, down which cotton is conveyed to the decks of steamboats by means of "slides," and artificial stairways have been constructed for the ascent and descent of passengers.

ALABAMA, ALIBAMO, ALIBAMON, or ALIBAMOU, as variously written, a tribe of Indians formerly existing in the interior of what is now the State of Alabama. Pickett, the Alabama historian, on the authority of Le Clerc Milfort and that of aboriginal traditions, represents them as having emigrated or been driven from the northern part of Mexico after its conquest by Cortez, and traces them to the banks of the Missouri, the Ohio, the Yazoo, and the Alabama rivers, in succession. De Soto, in 1541, found on the bank of a river supposed to be the Yazoo a strong fortress or fortified village, called by the chroniclers *Alibamo* or *Alimamu*, which he captured by assault after a desperate defence by the Indians. Bartram, the botanist, in 1777 mentions an Indian village called Alabama on the Mississippi River near Manchac, the inhabitants of which he describes as "a remnant of the ancient Alabama nation." Other traces of them are met from time to time in different places. At the period of the French colonization of Louisiana, however, at the close of the seventeenth and beginning of the eighteenth century, they were occupying the country on the upper Alabama and its affluents, the Coosa and Tallapoosa rivers. They seem to have been subdued and absorbed by the Creek Confederation; but a small band, with a few Coushattas, have long lived in Polk co., Texas.

ALABAMA CLAIMS. One of the most important international events of modern times was the settlement by arbitration of the claims generically known as the "Alabama Claims," between the United States of America and Great Britain. These claims arose out of depredations upon American commerce during the war of the Rebellion by vessels (of which the Alabama was the chief) fitted out or supplied in British ports under the direction of the Confederate Government. The basis of the claims of the United States Government was the alleged violation of neutrality by the British Government in permitting the Confederate cruisers to receive the privileges of British ports. The adjustment of this grave international controversy, which was tending towards war, was provided for by a convention known as the "Treaty of Washington," concluded May 8, 1871, and referring the "Alabama Claims" to a tribunal of arbitration to be composed of five members, named respectively by the Governments of the United States, Great Britain, Italy, Switzerland, and Brazil. The tribunal began its sessions in Geneva, Switzerland, Dec. 15, 1871, and was composed of Sir Alexander Cockburn, lord chief-justice of England, Charles Francis Adams of the United States, Count Frederic Sclopis of Italy, M. Jacques Staempfli, formerly president of the Swiss Confederation, and Viscount d'Itajuba of Brazil. The counsel for Great Britain was Lord Tenterden, assisted by Sir Roundell Palmer, afterwards made lord chancellor by the title of Lord Selborne. The counsel for the United States was J. C. Bancroft Davis, assisted by William M. Evarts, afterwards Secretary of State, Caleb Cushing, and Morrison R. Waite, afterwards chief-justice of the United States Supreme Court. Having organized on Dec. 15, 1871, and received the "cases" of the contending parties, the tribunal adjourned till June 15, 1872, after which it continued in session till September. The proceedings of this tribunal, confessedly the most august legal body ever assembled, were watched with the profoundest interest by all Christendom. The agents of the United States claimed, in addition to direct damages, consequential or indirect damages, to the extent of hundreds of millions of dollars, while the British agents contended against any liability whatever under the rules laid down in the Treaty of Washington, and especially against the allowance of consequential damages.

The rules guiding the action of the Geneva tribunal are known as the "Three Rules relating to Neutrals," and are the latest governmental expression of the principles of international law on the subjects involved, although they cannot be said to be fully incorporated into the law of nations, not having been formally adopted by any powers except the parties to the Treaty of Washington. The rules are as follows:

"A neutral Government is bound—

"1. To use due diligence to prevent the fitting out, arming, or equipping, within its jurisdiction, of any vessel which it has reasonable ground to believe is intended to cruise or carry on war against a power with which it is at peace; and also to use like diligence to prevent the departure from its jurisdiction of any vessel intended to cruise or carry on war as above, such vessel having been specially adapted, in whole or in part, within such jurisdiction, to warlike uses.

"2. Not to permit or suffer either belligerent to make use of its ports or waters as the base of naval operations against the other, or for the purpose of the renewal or augmentation of military supplies or arms or recruitment of men.

"3. To exercise due diligence in its waters, and as to all persons within its jurisdiction, to prevent any violation of the foregoing obligations and duties."

The importance attached to this enunciation of the principles of neutrality is enforced by the following stipulation in the treaty: "And the high contracting parties agree to observe these rules as between themselves in future, and to bring them to the knowledge of other maritime powers, and to invite them to accede to them."

On Sept. 14, 1872, the final decision of the tribunal was announced, signed by all the arbitrators except that of Great Britain, Lord Chief-Justice Cockburn, who afterward wrote an exhaustive dissenting opinion. The claims for consequential damages were rejected so far as they related to the indemnity for costs of pursuit of the Confederate cruisers, prospective earnings, double claims for the same losses, "gross freights" exceeding "net freights," and the like; and a gross sum of $15,500,000 in gold was awarded as the indemnity to be paid to the United States for the satisfaction of all the claims referred to the consideration of the tribunal.

The interpretation of the terms "due diligence," referred to in the first and third rules of the treaty, and their application to the complicated circumstances of the case, occupied the greater part of the time of the tribunal; and the principle was announced that "due diligence" "ought to be exercised by neutral Governments in exact proportion to the risks to which either of the belligerents may be exposed from a failure to fulfil the obligations of neutrality on their part." The settlement of the "Alabama Claims" gave general satisfaction in the United States, received a modified approval in Great Britain, and is believed to have furnished, as the most conspicuous example of international arbitration, a lasting impetus to the cause of international reform and peace. The disposition of the sum awarded by the tribunal will be treated of under the head of the GENEVA AWARD. (A. P. S.)

Though the Alabama had inflicted the greatest damage on American commerce, and had therefore given its name to the claims for compensation, it was not the first of the Confederate vessels for whose acts the United States held Great Britain responsible. Taking them in the order in which their cruises began, the full list comprised the Sumter, the Nashville, the Florida and three tenders, the Alabama and one tender, the Retribution, the Georgia, the Tallahassee, the Chickamauga, and the Shenandoah. The Sumter had been a mail-steamer running from New Orleans to Havana, but when the Southern States seceded she was fitted out as a war-vessel and placed under the command of Capt. Raphael Semmes, a native of Maryland, who had resigned from the United States navy to enter the Confederate service. By the time the Sumter was ready for sea the mouth of the Mississippi was blockaded, but she escaped on June 30, 1861, and within one month destroyed eleven American merchant-vessels. She then entered the British port of Trinidad, and remained six days, taking in a supply of coal, though United States vessels were refused such privileges. In her subsequent cruise the Sumter destroyed six American vessels, and arrived at Gibraltar Jan. 18, 1862. Here she was effectually hemmed in by war-vessels which had been despatched in pursuit of her by the United States Government. She was then nominally sold, in spite of the protest of Mr. Charles F. Adams, the American minister, and after being taken to Liverpool was repaired and used as a Confederate transport. The career of the Nashville was somewhat similar. She was a large paddle-wheel steamer, formerly plying between New York and Charleston. Armed with two guns, she escaped from Charleston harbor Oct. 26, 1861, took in a large supply of coal at the Bermudas, and set out to destroy American merchant-vessels. The Florida was an iron screw gunboat built at Liverpool on contract with the Confederate agent there, though at the time there was some pretence that she was intended for the Italian Government. The American minister and consul repeatedly warned the British authorities of the illegal character of the vessel, but she was permitted to sail March 23, 1862, clearing under the name Oreto, while still unarmed. At Nassau she received a full armament from a vessel which had followed her, and here her true character was so manifest that the civil authorities brought the case into court, but she was acquitted. Under the command of Capt. Maffitt she proceeded to cruise and capture American vessels, freely using British ports as her base of operations. By using the British flag she ran the blockade at Mobile in Sept., 1862, and remained there till the following January, when she came forth to resume her work of plunder and destruction. Three vessels captured by her were fitted out and sent on the same errand. Her whole career, which came to an end at Bahia, Brazil, Oct. 7, 1864, was acknowledged by Lord John Russell to be a scandal and reproach to the laws of Great Britain. The Alabama was a wooden steam sloop, built by Messrs. Laird & Sons at Birkenhead, near Liverpool, England, and specially adapted for swiftness. Her crew was composed of British seamen who had served on vessels of war. Though the attention of the British Government was promptly called to various illegal acts connected with the construction and outfit of this vessel, then called simply "No. 290," she was permitted, through the culpable negligence of the ministry, to escape July 31, 1862. As in the case of the Florida, she received her armament through the agency of vessels which followed her from England. Capt. Raphael Semmes and other officers of the Sumter took charge of the new vessel Aug. 20, at the Azores, and soon made her name, Alabama, a terror to American merchants. Instead of sending his prizes into port, Semmes destroyed nearly every vessel that fell into his power. He cruised first in the North Atlantic, then in the West Indies, then sailed around the Cape of Good Hope and carried on the work of destruction in the East Indies. Sixty-five vessels in all were captured, and damage inflicted to the amount of $6,000,000. Returning to the Atlantic, the Alabama entered Cherbourg harbor, on the north coast of France, June 11, 1864, and three days later the U. S. steamer Kearsarge, Capt. Winslow, appeared at its entrance. Each vessel had seven guns, though the superiority lay with the Kearsarge; the Alabama had 120 men and the Kearsarge 162. On June 19, Semmes came out and offered fight; after a battle of an hour, in which 28 were killed and wounded, the Alabama began to sink and Semmes struck his flag. He was rescued by Mr. John Lancaster in the English yacht Deerhound. The Retribution in 1862 cruised off the Bahamas, capturing American merchant-vessels. In 1863 she was sold in Nassau. The Georgia was a screw-steamer, built at Dumbarton, Scotland, and launched Jan. 10, 1863. Passing for a time under the name Japan, she received a crew of 80 men from Liverpool, and on April 2d started on her course. Her first capture, that of the Alar, was made in the English Channel, even before Commodore M. F. Maury, who was destined for her command, had come on board, and she remained registered as a British vessel till June 23d. She cruised in the Atlantic from the Western Islands to the Cape of Good Hope, then returned to Cherbourg, and finally to Liverpool, May 1, 1864, where she was repaired and nominally sold. Soon after leaving this port she was captured by the U. S. steamer Niagara. The Tallahassee and the Chickamauga had been built in England in 1864 as blockade-runners, but were afterwards fitted out to carry on the same kind of warfare as the Alabama, and used the ports of Nassau and the Bermudas to receive supplies and repairs. The Shenandoah was originally the British steamer Sea-King, employed in the East Indian trade. She passed into control of the Confederate agents in Sept., 1864, and in the next month sailed from Liverpool. Off the island of Madeira she was transformed in the usual manner into a vessel of war. She was commanded by Capt. Waddell, and her officers comprised several who had served on the Sumter, the Alabama, and the Georgia. Sailing to Melbourne, she destroyed several American merchant-vessels. She was then allowed to make extensive repairs and to enlist additional men, and sailed to the Arctic Ocean, where she destroyed a large number of whalers. She was registered as a British vessel till Oct. 17, 1865, and destroyed not less than fifteen vessels after her commander had learned of the downfall of the Southern Confederacy. After her arrival at Liverpool, Nov. 6, 1865, she was delivered to the British Government, and by it to the United States.

From the foregoing sketch it will be seen that the Alabama and the Shenandoah had sailed from British ports, and never entered a Confederate port; with regard to the others, damages were claimed only for the injuries inflicted by them on American commerce after they had received at British ports privileges in violation of the established principles of international law.

The Geneva tribunal decided that the vessels with respect to which Great Britain was guilty of *laches* were the Alabama, the Florida, and the Shenandoah after leaving Melbourne. The other vessels are called the "exculpated" cruisers. (J. P. L.)

ALAMAN, Lucas (1775?–1855), a Mexican statesman and historian, was born in Mexico about 1775. He represented the colony in the Spanish Cortes, but when the republic was established in 1823, returned to his native country. He was a member of the cabinet of Gen. Guadalupe Victoria, the first president, and afterwards (1830) of that of Bustamente. He promoted manufactures, agriculture, and public education. The constant recurrence of revolutions convinced him of the necessity of a strong government for Mexico, and he gave his support to Santa Anna's dictatorship (1835). When the latter was restored to power in 1853, Alaman was made minister of foreign affairs. His policy was now entirely reactionary; he opposed the liberty of the press and urged the establishment of a standing army, with regular provision for its maintenance. He died June 2, 1855. He published *Dissertations on Mexican History* (3 vols., Mexico, 1844–49) and a *History of Mexico* (5 vols. 1849–52). An improved edition of the latter, which is the standard history of that country, was issued by J. M. de Liceaga (Guanaxuato, 1868).

ALAMEDA, an incorporated town of Alameda co., Cal., is on a peninsula about 4 miles long on the east side of San Francisco Bay, at the mouth of San Antonio Creek. The peninsula comprises about 2200 acres of upland, the highest portion being 24 feet above high-water mark, and 1000 acres of marsh. Previous to 1852 the town-site was densely covered with oaks; now these have disappeared, and other shade trees give the town a beautiful appearance. It has five hotels, a national bank, three weekly newspapers, six churches, a convent, five public and six private schools, and a public library. Its industrial works comprise a soap-factory, powder-works, grist-mill, nut-oil factory, oil-refinery, and planing-mill. In 1852 the town-site was sold for $14,000; it is now valued at $5,000,000, and the improvements are worth $2,000,000. The public debt is $20,000, and the expenses for the year 1881 were $50,629. The town is lighted with gas and furnished with pure water from eight artesian wells, which supply a reservoir 60 feet square, with a capacity of 300,000 gallons. The two railroads which pass through the town to San Francisco make about sixty trips each day. During the summer there are several bathing establishments at Alameda, which carry on a brisk business. By the census of 1880 the population numbered 5708, and the yearly increase is estimated at 600. About one-fourth of the inhabitants are of foreign birth, chiefly Germans and Danes.

ALAMO, a fort and village, separated by the San Antonio River from the town of San Antonio, Texas, and celebrated in connection with the Texan War of Independence. The name in Spanish means "poplar," and the place was originally a "mission," the chapel bearing the date 1757. The whole area included more than two acres, and was surrounded by walls from nine to twelve feet high and nearly three feet thick. The Mexican general Cos had surrendered San Antonio in the autumn of 1835 to the Texans, who had taken arms against Santa Anna's dictatorship. Early in 1836, Santa Anna marched against the insurgents with an army of 8000 men. He reached San Antonio Feb. 22, 1836, with about 3000 men, and at once planted two batteries bearing on the Alamo. The garrison here consisted of two companies of volunteers, most of whom had recently arrived from the southern part of the United States, and among whom were the eccentric Col. David Crockett of Tennessee and J. B. Bonham of South Carolina. James Bowie, whose name is perpetuated in the formidable knife invented and used by him in bloody encounters, had been elected colonel by the volunteers during February. Col. William Barrett Travis also had been assigned to the command of the fort by the provisional governor of Texas, and brought a small reinforcement about ten days before the arrival of Santa Anna. The illness of Col. Bowie had prevented any conflict of authority, and the pressing danger compelled the restless adventurers to submit to some degree of discipline. The Mexicans kept up an active cannonade on the fort, and there were frequent skirmishes by day and alarms at night. Col. Travis sent out some couriers to summon aid, and in his last despatch (March 3) said, "With 145 men I have held this place for ten days against a force variously estimated at from 1500 to 6000, and I shall continue to hold it until I get relief from my countrymen, or I will perish in the attempt. We have had a shower of bombs and cannon-balls continually falling among us the whole time, yet none of us have fallen." In this statement Col. Travis appears to have given only his effective force, omitting also 32 men who had made their way through the enemy into the fort only two days before. The total of the garrison was 188 men, and they had 14 small cannon around the walls. Santa Anna called a council of war, and in accordance with its decision an assault was made at daybreak on the 6th of March. Three divisions advanced to the attack under the command of Gen. Castrillo, a Spaniard, while Santa Anna, taking his station with bands of music 500 yards south of the fort, sounded "No quarter." One of the attacking-parties was repulsed; the second was checked for a time; but the third scaled the wall. Col. Travis was killed at his post, and the defenders, taking refuge in the barracks, kept up a deadly fire from the doors and windows. One of the guns on the wall was turned upon them, and room after room was carried at the point of the bayonet. Col. Bowie, confined to bed by disease, is said to have shot down some of his assailants before being killed. Some of the garrison were posted in the old chapel, which had been unroofed long before, and here the last fighting took place. Major Evans is said to have been killed while attempting to blow up the magazine. A few soldiers who had escaped from the enclosure were slain by cavalry outside, and Lieut. Dickenson, with his child, was shot as he leaped from the chapel-window. The whole action occupied less than one hour, and Santa Anna, entering towards the close, inflicted indignities on the bodies of his fallen foes and ordered them to be burnt. Half an hour later a few men were found concealed beneath some mattresses, and the ruthless Mexican ordered them to be shot. Mrs. Dickenson, a few Mexican women with their children, and a negro were the only inmates of the fort whose lives were spared. The Mexican loss exceeded 500, though Santa Anna, with his customary falsehood, stated it as 60 killed and 300 wounded. The massacre of this garrison was intended to strike terror into the insurgents, but it only roused them to vengeance and deeds of desperate valor. Only eight weeks later, at San Jacinto (April 21, 1836), Gen. Sam Houston, with 783 Texans fiercely shouting "Remember the Alamo!" charged on Santa Anna's army, utterly routing it, and capturing its leader, whose life was spared. The independence of Texas had been declared two days before the fall of the Alamo, but its defenders were not aware of this fact. In 1837, Gen. Houston, then governor of Texas, ordered the bones and ashes of the defenders of the Alamo to be gathered and buried. The place of burial, however, was not properly marked, and is not known exactly. A handsome monument, made from the stones of the Alamo by the artist Nangle in 1841, stands now in the vestibule of the State Capitol at Austin, Texas. (See the *Magazine of American History*, 1878.)

See Vol. I. p. 353 Am. ed. (p. 443 Edin. ed.).

ALASKA derives its name from a Russian corruption of an Aleutian word—Alakshak—which signifies "continent" or a "large country." The Russian version, or rather perversion, of the term was "Aliaska," and it was applied only to the prominent peninsula jutting out from the continent in a south-westerly direction, and dividing, together with the Aleutian chain of islands, the waters of Bering Sea from those of the North Pacific. This name as subsequently modified was adopted by the Government of the United States for the whole territory formerly known as Russian America.

Alaska is bounded on the north by the Arctic Ocean; on the west and south by Bering Sea and the North Pacific; while the eastern boundary runs from the Arctic coast along the 141st meridian to its intersection with a rather indefinite line running from lat. 54° 40′ in Portland Canal northward to the head of that inlet, and thence along the summits of a chain of mountains parallel with the coast, at a distance of not more than three marine leagues from the seashore. Prince of Wales Island, though extending somewhat to the south of lat. 54° 40′, belongs entirely to Alaska. In its greatest length from north to south the territory extends over fifteen and a half degrees of latitude (about 1100 statute miles). Its greatest breadth from east to west, along a line drawn from the 141st meridian to Cape Rumiantzof, in lat. 60° 20′, is twenty-five degrees of longitude (between 700 and 800 miles), but the distance between Portland Canal on the east (lat. 54° 40′) and Attoo, the westernmost island of the Aleutian chain (lat. 53°) is fifty-seven degrees of longitude, or 2100 statute miles, the latter point being situated in long. 173° east of Greenwich. If Attoo be accepted as the western extremity of the United States, San Francisco would be nearly the geographical centre with reference to longitude only. The superficial area of Alaska, according to latest computations, is 531,000 square miles.

Owing to such peculiarities of contour as narrow peninsulas, deep indentations, and numerous islands, the actual coast-line of Alaska is very long in proportion to its superficial area, amounting to over 8000 miles.

The Alexander Archipelago, which completely masks the coast from the British Columbia line to Cape Spencer, contains many hundred islands, the most important being Baranof, Chichagof, Admiralty, Revilla Gigedo, and Prince of Wales islands. Prince William Sound contains a number of islands, among them Nuchek (Hinchinbrook of Cook) and Sukluk (Montague). The Kadiak group comprises Kadiak, Afognak, and Trinity islands, and many of less importance. The largest islands of the Shumagin group are Ounga, Nagaï, and Popof. The Aleutian chain embraces a large number of islands, extending over twenty-three degrees of longitude, the largest being Oonimak, Oonalashka, Oumnak, Atkha, Adakh, Tanaga, Kishka, and Attoo. The islands of Bering Sea belonging to Alaska are St. Paul and St. George (the Seal Islands); St. Matthew, Nunivok, St. Lawrence, King's Island, and one of the Diomedes in Bering Strait. The most prominant capes and headlands are Point Barrow, Icy Cape, Cape Lisburn, Point Hope, and Cape Krusenstern in the Arctic; Cape Prince of Wales in Bering Strait; Cape Rumiantzof, Cape Vancouver, Cape Newenham, and Cape Constantine in Bering Sea; Cape Douglas and Cape Elizabeth at the entrance to Cook's Inlet; Cape St. Elias on Kayes (or Kaiak) Island; Cape Spencer, the northern head of Cross Sound; Cape Ommaney, the south point of Baranof Island; Cape Kaigan, on Prince of Wales Island, and Cape Fox, the southernmost point of the main land of Alaska. The most important bays and estuaries along the sea-coast are Bucarelli Sound or Klowak Bay, on the west coast of Prince of Wales Island; Sitka Bay or Norfolk Sound, on Baranof Island; Yakutat or Bering Bay, just south of Mount St. Elias; Prince William Sound; Cook's Inlet; Chiniak Bay, on Kadiak Island; Captain's Harbor, on Oonalashka Island; Moller Bay, on the west coast of the Aliaska peninsula; Bristol Bay; the wide estuary of the Kuskokvim River; Norton Sound and Port Clarence, in Bering Sea; and Kotzebue Sound, in the Arctic.

The largest river of Alaska, and perhaps of North America, is the Yukon, thus named by the Indians of the interior, while the Innuit settled near its mouth call it Kvikhpak ("great river"). The length of the Yukon is not at present known, since its sources, lying in the British possessions, have not been explored or even definitely located; but two stern-wheel steamers of light draught navigate its waters for a distance of 1200 or 1400 miles from the sea. The river next in size and importance is the Kuskokvim, which, like the Yukon, empties its waters into Bering Sea. It is about 1000 miles in length, and navigable for at least one-third of the distance. The remarkable shallowness of the eastern half of Bering Sea is doubtless due to the discharge of sediment from these two great rivers. Following the coast eastward, we next come to the rivers Togiak and Nushegak, emptying into Bristol Bay. Two rivers of importance flow into Cook's Inlet from the north—the Sushetno and the Kinik—and two somewhat smaller, the Kaknu (Kenaï) and the Kassilof. The Atna or Copper River debouches from the unknown interior just east of Prince William Sound, but from this point eastward and southward the rivers are very short, running their whole course over a narrow shelf of low land between the St. Elias Alps and the sea. Other rivers in this section have their source in British territory, and merely pass over Alaskan soil within 20 or 30 miles of their mouths, like the Takoo, the Stakhine, and others. A few of the Alaskan rivers fall into the Arctic Ocean. but nothing is known of their interior course. They are the Selawik and the Noatak, emptying into Kotzebue Sound, and the Kok and the Colville rivers, flowing, the former west, the latter east, of Point Barrow.

The mountain-system of Alaska has not yet been fully explored, but we know of a continuous chain (probably an extension of the Cascade and British Columbian range) following the coast closely, and attaining its greatest height in the great bend of the coast between Cape Spencer and Cape Elizabeth. In this region rise the St. Elias and the Chugatch Alps, the former with peaks, such as St. Elias, 18,000 or 19,000 feet, Mount Fairweather, Mount Crillon, and Mount Cook, rising from 14,000 to 16,000 feet; while the snow-capped summits of the Chugatch and Kenaï ranges have not yet been measured. Another, probably less elevated, range, an extension of the Rocky Mountains, runs nearly parallel with the former, also describing a curve, sending its western branch down the Aliaska peninsula. The central portion of this range is almost wholly unknown, Mount Wrangell, on the Upper Copper River, being the only peak named and located; but beyond the great bend, on the western shore of Cook's Inlet, we have the Redoute and Ilyamna peaks, of 11,000 and 12,000 feet respectively, the latter being an active volcano, and Mount Isaac; on the Aliaska peninsula the "Four Peaks," Mounts Veniaminof, Olai, and Pavlof, and on the Aleutian Islands the peaks of Pogromnoi and Shishaldin (8000 feet) on Oonimak Island, Makushin on Oonalashka, Korovin on Atkha, and many others, all of volcanic origin and many still active. An offshoot of the main Alaskan or Chigmit range extends between the upper Kuskokvim and the Yukon and Tennanah rivers. A chain of barren mountains of no great altitude runs in a north-easterly direction from the peninsula formed by Norton and Kotzebue Sounds, and constitutes the watershed between the Arctic and Yukon basin. A prominent feature of Alaska, connected with its mountain-system, consists in its glaciers. These "chisels in the hand of Nature" are found here of unusual and almost incredible dimensions. Many of them have a working face from five to twenty miles in width, and as nearly all reach down to the sea, they are easily accessible to the traveller. The largest glaciers are found on the mainland lying back of the Alexander Archipelago, on Lynn Canal, Glacier Bay, and in the St. Elias and Chugatch Alps. To the northward of Bering Bay a long reach of coast consists of nothing but ice-cliffs.

The history of Alaska begins with the discovery of its coast by Bering and Chirikof in 1741, and the subsequent occupation of the Aleutian Islands by the Siberian "promyshleniks," or fur-hunters. These rough pioneers advanced gradually from island to island; in 1762 the island of Kadiak had already been visited, and the Aliaska peninsula was known to be a part of the American continent; and in 1778, Capt. Cook's report of the existence of sea-otters all along the coast from Nootka to Cook's Inlet gave a new impetus to Russian enterprise, causing an eastward extension of operations. The natives of the Aleutian Islands were treated with great cruelty by these first Russian visitors, robbed of the proceeds of the chase without receiving any equivalent, and forced to labor without compensation. At last, the patience even of this meek people was exhausted, and then followed a series of uprisings, generally preconcerted; but, though the islanders succeeded in massacring isolated parties of hunters and in destroying some ships that had been hauled up on the beach for the winter, the superior arms and courage of the Russians gained the day, and the desperate movement resulted in the utter subjection of the Aleuts, amounting almost to slavery. Not satisfied with oppressing their victims at home, the Muscovite masters carried the able-bodied hunters away to the eastward to kill sea-otters for them along a dangerous coast inhabited by savage and warlike tribes. In the mean time, accounts of the actions of individual traders and hunters had reached the imperial court, and the representative of one of the firms then operating in North-west America succeeded, with the help of intrigue and bribery, in securing the exclusive privilege of trading and hunting in the islands and continent claimed as Russian discoveries. An imperial grant or charter for a period of twenty years was formally issued by the emperor Paul in 1799. Previous to this arrangement there had been much wrangling, and even open hostility and warlike operations, between the rival companies, but when the Russian American Company was organized by Grigor Shelikhof and his partners, and when the iron-willed Baranof was entrusted with the management of affairs in the colonies, the unruly spirits were put down by force of arms and trickery, and the company entered upon a period of conquest and prosperity. Before many years Baranof, with his Aleut hunters and an armed force of Russians, had advanced to the Alexander Archipelago. In 1801 the first permanent settlement was founded at Sitka, but during the absence of Baranof, who then had his headquarters on Kadiak Island, the Indians (of the Thlinket nation) surprised the garrison, killing and capturing all the inmates with a few exceptions. At the time Baranof was powerless, owing to the non-arrival of supplies and reinforcements, but three years later he punished his enemies with the assistance of a sloop-of-war which had opportunely arrived from Russia. He rebuilt the settlement in a safer locality, and fixed there his headquarters and the central point of Russian colonization in America. Under Baranof's management the affairs of the Russian American Company flourished. A colony was established on the coast of California, and an active trade inaugurated with the English and American ships visiting the coast, with the Spanish colonies, the Sandwich Islands, and China. The nobility of Russia, and even members of the imperial family, bought shares in the concern, and when the first charter-term of twenty years expired the company's exclusive privileges were not only renewed, but largely increased. These privileges were again renewed in 1840, but when another term expired in 1860 the business had declined to such an extent that the company refused to assume again the whole cost of maintaining, governing and protecting the colonies, while the imperial Government was equally unwilling to incur expense in behalf of these distant possessions that brought no direct revenue to the treasury. Negotiations continued for several years, and finally the whole country was sold to the United States in 1867 for the sum of $7,200,000, in the face of strong opposition in both houses of Congress. Secretary of State Seward and Senator Sumner were the most energetic supporters of the measure. On the 18th of October, 1867, the Russian flag was lowered at Sitka and replaced by the Stars and Stripes. The first step taken by the U. S. Government was to make Alaska a military district, and then a department, locating military garrisons at Tongass, Wrangell, Sitka, Kadiak, and Kenaï or Cook's Inlet. No attempt at civil organization was made. In 1870 all the garrisons except that at Sitka were withdrawn, but subsequently a small force was again stationed at Wrangell, a few difficulties with Indians having occurred in that vicinity. The final withdrawal of troops took place in 1877. In 1879 rumors of threatened outbreaks and a clamor for protection caused the Government to station a man-of-war at Sitka, and this practice is maintained to the present day, the crew of the vessel acting as a police force in cases of emergency. The whole territory has been constituted a collection district of the customs service; revenue-cutters patrol the coasts and islands at long intervals, but no legal authority of any kind has been introduced, a bill to establish a simple form of Territorial government having failed to pass Congress in the session of 1881–82, although its passage was asked by the white people of the country.

The trade and traffic of Alaska are at present confined to furs and fish and a very small production of minerals and timber. The furs must be considered as the most important product of the past and present, while fish promises to be the staple of the future and a warrant of coming prosperity. The Russian American Company derived large profits in exchanging the most valuable furs (sea-otter, fur-seal, and land-otter) for tea on the Chinese frontier, and importing that article into Russia; but with the transfer of Alaska its resources became accessible to everybody, and a fierce rivalry in trade was the result. A San Francisco firm had purchased the buildings, vessels, and other improvements of the Russian company, but was, of course, unable to secure its privileges; in 1870 the same firm was incorporated as the Alaska Commercial Company, and obtained from the U. S. Government the lease of the Pribylof Islands, the only resort of the fur-seal in Alaskan waters, for twenty years. This was an exceedingly valuable franchise, but in the trade in all other furs, both land and marine, competition is so active as to be almost ruinous. The annual yield of furs in Alaska at present is as follows: Fur-seal, 100,000 skins, valued at $1,500,000; sea-otter, 5500, worth $500,000; beavers, 10,000, worth $25,000; silver foxes, 2000, valued at $20,000; marten, 20,000, worth $60,000; red and cross foxes, 10,000, worth $15,000; other skins of minor value, amounting to about $25,000—making a total of 162,000 skins, valued at $2,145,000. The U. S. Government derives from the Fur-seal Islands in rent and royalty $317,000 per annum, having already received on this account over one-half of the purchase-price of Alaska. In order to make the natives of Alaska self-supporting, and at the same time to protect the fur-bearing animals against too ardent pursuit with improved arms, white men are prohibited from hunting or trapping; but in spite of such precautions there can be no doubt of the ultimate extermination of fur-bearing animals in the course of time, with the exception of fur-seals, which under the present system are fully protected.

The fisheries of Alaska are annually increasing in importance. The supply of fish may be considered as unlimited, though the consumption by natives alone is immense, amounting to at least 500 pounds of salmon per annum for each inhabitant, or an aggregate of over 16,000,000 pounds, in addition to other fish, such as halibut, cod, and herring. The export of fish from Alaska has until lately been limited by the demand of the Pacific coast, but a market is gradually being developed for it in the Eastern States and in Europe. The codfish catch on the Shumagin banks now amounts to about 500,000 fish per annum, averaging two and a half pounds in weight, cured, and selling at five and six cents per pound. A dozen vessels only are now engaged in this fishery. About 6000 gallons of cod-liver oil are made annually, selling at $1 refined, and at forty cents per gallon crude. It has been calculated that 100,000 square miles of codfish-banks are still lying idle in Alaskan waters. The salmon-canneries on Prince of Wales Island, Kadiak, and Cook's Inlet produce now an aggregate of 22,000 cases per annum, and to this may be added 4000 to 5000 barrels of salted salmon. The average weight of salmon in Alaska, cleaned, is thirty-five pounds. An Oregon firm operating on the islands of the Alexander Archipelago produces 15,000 gallons of herring oil, 12,000 gallons of dogfish oil, and 3000 gallons of whale oil. The whaling fleet engaged on the Arctic shores of Alaska numbers 36 sailing craft and 4 steamers. The catch in 1881 was 354,000 pounds of bone, 15,000 pounds of walrus ivory, and 21,000 barrels of oil. The bone was valued at $850,000, the oil at $280,000, and the ivory at $9000.

The climate and agricultural resources of Alaska are so closely connected with each other as to admit of joint discussion. The country may be divided for this purpose into five divisions: (1) The Arctic district, vast in extent, but differing in no way from other hyperborean regions, cannot be considered in connection with agriculture. (2) The Yukon district, or the heart of continental Alaska, has a mean annual temperature of +25° Fahr., the extremes being −60° and −70° in winter, and +70°, and even +80°, in midsummer. The snowfall throughout this region is very heavy and the winter long. Under a thick non-conductive carpet of sphagnous vegetation a deep stratum of the soil is kept perpetually frozen. Radishes and turnips have been successfully grown in this region on sloping ground with southern exposure and natural drainage, but as a whole this district holds out no promise to the agriculturist. (3) The Bristol Bay and Aleutian district, comprising the coast of Bering Sea from the Kuskokvim eastward and southward and the Aleutian Islands, is almost destitute of timber and consists of steep, rocky hills, alternating with marshy plains or "tundra." The mean annual temperature is about +35°, but the winters are long and the summers wet and stormy. Fine native grasses cover the hillsides and valleys during the brief season, affording excellent pasture, but atmospherical moisture and scarcity of sunshine would prevent the curing of hay in quantities sufficient for wintering herds of cattle. On the islands of this district attempts to cultivate vegetables have thus far resulted in failure; in the continental portion no experiments have been made, but its conditions would appear more favorable. (4) The Kadiak district, including also Cook's Inlet, has always been considered the most promising in Alaska with regard to agriculture; and here (especially on the islands of Afognak and Kadiak) small fields of turnips and potatoes are cultivated every year with fair success. The drier climate of this section would enable the people to make hay and keep cattle, were they thus inclined, and there is every reason to believe that the fishermen-farmers of Iceland and Norway would thrive here could they be induced to come. (5) The Sitkan district, east of the 141st meridian, is rugged and mountainous in the extreme, and generally densely wooded. The mean annual temperature is +43°, and the annual rainfall from 68 to 80 inches. The winters are not as cold as those of New York, but are very stormy. Potatoes and the principal vegetables of the North do extremely well in the few spots of level ground. Grain does not ripen in any portion of Alaska.

The only timber in Alaska of value at the present time consists of small bodies of yellow cedar in South-eastern Alaska, a knotty spruce being the universal forest tree elsewhere. In all that vast portion of Alaska lying west of the 141st meridian no timber grows at a higher altitude than 1000 feet above the sea-level, and the Aliaska peninsula, the Shumagin and Aleutian Islands, the islands of Bering Sea, and nearly all the low coast-region are entirely devoid of timber.

Of the minerals of Alaska our knowledge is still incomplete. Many veins of coal are known to exist in various sections of the country, but the quality has not been sufficiently established to secure a market. Indications of lead, silver, and cinnabar have been found in various localities, and in South-eastern Alaska, near the British Columbian frontier, some surface gold-mines are being worked with moderate success. Shipments of bullion from these mines since their discovery in 1880 have been variously stated at from $50,000 to $150,000.

The exploration of Alaska since its acquisition by the United States has been confined to the exploits of a few observers of the Signal Service and collectors of the Smithsonian Institution stationed in the country. Surveys of a few harbors and portions of the coast have been made under the auspices of the U. S. Coast and Geodetic Survey and of the Navy Department, but no organized and connected exploration has thus far been inaugurated.

The inhabitants of Alaska may be roughly classed as follows: 1, the Innuit or Eskimo, living on the coasts of the Arctic and of Bering Sea, extending to the eastward as far as Copper River; 2, the Tinnehs, or Indians of the vast interior of continental Alaska, impinging upon the coast only at Cook's Inlet; 3, the Aleut, inhabiting the islands from the Shumagin group to the end of the Aleutian chain, and also a few settlements on the Aliaska peninsula; 4, the Thlinket, living on the coast of the North Pacific from Copper River eastward and on the islands and coast of the Alexander Archipelago; 5, the Hydas, inhabiting the southern portion of the same archipelago; 6, the creoles or Russian half-castes; and 7, the whites, both foreign and American, the two last classes being scattered over all the settlements. The census report of 1880 places the total population of Alaska at 33,620, distributed as follows: White, 430; creole, 1746; Innuit, 17,517; Aleut, 2145; Tinneh, 4237; Thlinket, 6757; and Hydas, 780. Since 1880 the white population of the south-eastern section has been increased by an influx of miners, while the natives of the Aleutian Islands and the Kadiak district have been decimated by an epidemic typhoid pneumonia.

The most important settlements of Alaska are—Sitka (formerly New Arkhangel), on Baranof Island, with 1500 whites and Indians, the cathedral of the Russian Church in Alaska, the residence of the U. S. collector of customs; Wrangell, near the mouth of the Stakhine River, residence of a deputy collector, headquarters of Presbyterian and Roman Catholic missions, and transit port for the trade with the Cassier mines in British Columbia—contains about 500 whites and Indians; Juneau City, or Harrisburg, with about 1000 people, a mining-camp of recent growth; St. Paul Harbor, on Kadiak Island, population about 300 whites and creoles, residence of a deputy collector and fur-trading centre; Ounga, on island of same name, population 200, Aleut and white, chiefly sea-otter hunters: on the neighboring island of Popof is a station of the cod-fishing fleet; Belkovsky, on the Aliaska peninsula, with 300 native inhabitants and one or two whites, is the chief market for the sea-otter trade; Oonalashka, on island of same name, with 400 people, chiefly natives, residence of deputy collector and port of entry, also distributing-point of supplies for a large fur-trading district; the villages of St. Paul and St. George, on the Pribylof Islands, inhabited by 300 native sealers; and, finally, St. Michael, on Norton Sound, the outlet and trading mart of the Yukon region. (I. P.)

ALAUDIDÆ (Low Lat. *alauda*, a lark; Celtic *al*, high, *aud*, song), a family of oscine passerine birds, the larks. The family is notably distinguished from other oscine passerines by having the tarsal envelope peculiarly constructed. Instead of being formed behind by two horny plates which meet in a sharp ridge, constituting the *laminiplantar* arrangement common to nearly all oscines, the tarsus of *Alaudidæ* is as blunt behind as before, and consists of a series of scales or scutellæ lapping quite around; it is therefore *scutelliplantar*. Notwithstanding this modification, which is common to birds less highly organized than Oscines, the larks have the syrinx highly developed as a musical organ, and some of them, as the skylark of Europe, *Alauda arvensis*, are famous musicians. The first primary is spurious or quite rudimentary; and this character, in connection with the concealment of the nostril by a tuft of antrorse feathers, or their exposure, divides the family into two sub-families. Larks are eminently terrestrial birds, and in accordance with this the hind claw is lengthened and straight or little curved. There are numerous species of several genera, inhabiting plains and deserts of most parts of the world, but particularly the Eastern hemisphere, the only American representative being the horned or shore-lark, *Eremophila alpestris*. Birds of this family must not be confounded with the pipits or tit-*larks* of the family *Motacillidæ*. (E. C.)

See Vol. I. p. 395 Am. ed. (p. 446 Edin. ed.).

ALBANIA. The recent history turns chiefly on the resistance of the Albanians to the execution of the terms of the Treaty of Berlin. The powers conceded the claims of the Montenegrins to an increase of territory, but, as in 1815 their conquest of Cattaro and their natural outlet into the Adriatic was taken from them and given to Austria by the diplomats at Vienna, so in 1878 the Slavonic territory they had won from the Turks in 1876–77 was given to Austria-Hungary by the cession of the Herzegovina. This made it necessary to extend the Montenegrin territories, if at all, at the expense of their hereditary enemies the Albanians, for the lands adjacent to the Black Mountain on all other sides contain a mixed population largely Albanian.

The provinces first offered to the Montenegrins were those of Plava and Gusinje, besides Spuz and Podgorizza. But when the Turkish troops under Mukhtar Pasha evacuated these provinces in the winter of 1879, the Albanians took possession, and refused to yield it. Through the mediation of Italy the Porte proposed the substitution of the district of Tusi, lying southward from Podgorizza; and this was accepted April 11, 1880. This concession was equally offensive to the Albanians, and with the manifest connivance of the Turkish commander they again anticipated the Montenegrins in taking possession. The united powers now proposed the substitution of Dulcigno, on the Adriatic coast, which would give Montenegro an outlet seaward, though only awkwardly accessible. The sultan resisted, and the Albanians occupied the port and its territory with their troops. After urging the matter diplomatically, the powers united in a naval demonstration in August and September, but it resulted in nothing, until England proposed the occupation of Smyrna unless Dulcigno were ceded. Then Dervish Pasha was sent with troops, and after a failure to bring the league to peaceful concession, and some hard fighting, the Albanians were driven out, and on the 27th of November the possession was transferred to Montenegro. A general emigration of its Albanian population has resulted, to the impoverishment of the district. The Montenegrins have tried to induce them to remain.

One effect of this resistance was a general awakening of national feeling among the Albanians of the north. Catholics (Miridites) and Moslems made common cause to prevent the cession of territory to Slavs of the Greek Church. It is charged that Italian influences were especially visible. On the 19th of April, 1880, a great assembly was held at Scutari, under the presidency of the Catholic archbishop, to effect a closer organization of the nation, to adopt a national banner, and to prepare resistance to the cession of Tusi. A national council of forty delegates from the northern districts was established, with its seat at Prisrend. It commanded the people to pay the tithes and taxes into its treasury, and established a superior court of justice. On the 18th of May it protested against the cession of Tusi in a document addressed to the great powers, asserting the rights of the Albanian people, and declaring that they would not yield a foot of their territory to Slavic rule. The loss of Dulcigno caused some abatement of these pretensions, and in Dec., 1880, Dervish sent to Constantinople as prisoners and hostages several of the chiefs of the league, among others the Miridite prince Prenk Doda. But the spirit of the league was by no means broken, and it awaited the opportunity of a war between Greece and Turkey to declare its independence. Similar plans were discussed by a second league of Catholics and Moslems, which had been formed at Scodra under the sanction of the Porte, but they came to nothing, because of dissensions which broke up the league. During the progress of the negotiations with regard to the Greek frontier, Dervish Pasha assumed the offensive, defeated the Albanians at Verschirowice, April 20, 1881, and laid siege to Prisrend, which he captured, and the league was dissolved. About the same time the Porte suppressed a movement in Eastern Albania to set up Ali Pasha of Gusinje as king of the whole nation.

Troubles similar to those of Northern Albania were expected among the Torki of the south. The Treaty of Berlin called for the cession to Greece of Janina, Metzowa, Larissa, Prevesa, and Arta, and all the territory southward. With the Thessalian territory the Albanians have no concern, but the Epirote districts were largely their own home; and although the Porte had refused to accept the boundary proposed by the powers, there was little reason to hope that it would continue its resistance in the face of the evident purpose of the powers to enforce their arrangement. As the Torki differ from the Albanians of the North in dialect, dress, manners, and customs, their mutual repugnance has been found too strong to be overcome by community of race and creed. But a third league to resist the Greek claims was formed at Janina, with the encouragement of the Porte. As further conference with the sultan's advisers led to the adoption of a line less favorable to Greece, and one which left Janina in Turkish hands, the likelihood of a collision passed away.

These changes of boundary have caused the reduction of the Albanian territory by 967 square miles in the south, and about 265 square miles in the north. It is about 200 miles in length from north to south, and about 40 or 50 miles in width. The Skipetar race number about 1,750,000, of whom about 250,000 are in Greek territory, 100,000 in Italy, and as many in parts of European Turkey, leaving 1,300,000 in Albania proper. Of these, 120,000 are Catholics, 280,000 of the Greek Church, and the rest Moslems. (R. E. T.)

ALBANY, the county-seat of Dougherty co., Ga., is at the head of navigation on Flint River, 107 miles south of Macon, with which it is connected by the South-western Railroad. It is the terminus of the Brunswick and Albany Railroad, and has branch roads south to Thomasville and west to Arlington. It has a court-house, a bank, two weekly newspapers, and eight churches. Cotton is shipped in large quantities. Population, 3216.

See Vol. I. p. 397 Am. ed. (p. 448 Edin. ed.).

ALBANY, the capital of the State of New York and county-seat of the county of Albany, is on the W. bank of the Hudson River, 144 miles N. of New York and 201 miles (by rail) W. of Boston, in 40° 39′ 49″ N. lat. and 73° 44′ 33″ W. long. The principal part of the city stands upon three hills and a part of a fourth, which are separated by deep ravines. The lower part of the city, a water-frontage of over 3 miles, is annually covered by the spring overflow of the Hudson. To the westward of this territory, and upon higher ground, are Broadway and Pearl Street, the main business thoroughfares from north to south. Across these, at right angles, is State Street, which ascends to a plateau nearly 200 feet above the level of the water. This street is the chief public market of the city. With the exception of these three avenues, most of the streets are narrow, but they are brilliantly lighted with electricity—a method which Albany was the first city to use on an extensive scale. Water is distributed from a series of reservoirs, most of it being brought from a lake in the Sand Plains, 5 miles distant. The river also furnishes an additional supply. In the older parts of the city the houses are built close upon the sidewalks, but there is an improvement in the vicinity of Washington Park, a finely laid out tract of 300 acres near the western limits. Aside from this park the only large openings are Capitol Park and Academy Park at the top of the State Street hill. The county penitentiary was built in 1845, but it has been enlarged, so that it accommodates over 1000 prisoners. The county has no building of its own for courts and offices. A portion of its wants is supplied by the city hall. This building, completed in 1883, is of granite, in the modern Gothic style, and cost over $200,000. The police and fire departments, the police court, etc., occupy a building erected by the city in 1870. Albany is divided into 17 wards, each of which elects two members of the board of aldermen annually on the second Tuesday in April. The machinery of the fire department consists of 8 steam-engines, 2 trucks, an insurance patrol, and a telegraph. For police purposes the city is apportioned into five precincts, with an efficient force. Several infantry companies of the national guard of the State and four independent companies maintain the military reputation of the city. Seventy-six churches serve the religious wants of the citizens, as follows: Baptist, 12; Congregational, 1; Episcopal, 9; Evangelical, 2; Friends, 1; Jewish, 3; Lutheran, 5; Methodist, 11; Presbyterian, 11; Reformed, 5; Roman Catholic, 12; Second Adventist, 1; Union, 2; Universalist, 1. The earlier church societies organized were these: Dutch, 1640; Lutheran, 1680; Episcopal, 1715; Roman Catholic, 1796. The finest church edifice in the city is the Roman Catholic cathedral of the Immaculate Conception. The next finest edifice is St. Peter's Episcopal church, a fine specimen of the twelfth-century Gothic. All Saints' is the Episcopal cathedral, Albany being the seat of a diocese of that Church, as well as of the Roman Catholic Church. Eight daily newspapers, 11 weeklies, and 3 monthly periodicals are published here. The public schools are under the charge of a board of public instruction and a superintendent. The high school has 1 principal and 19 assistant teachers, and there are 25 other public schools, besides a State normal school established in 1844. The Albany Academy, for the instruction of boys, occupies a stone building in Academy Park; and the female academy is conspicuously located in North Pearl Street. The leading Roman Catholic institution for girls is the Academy of the Sacred Heart, and for boys, the academy of the Christian Brothers. The leading school of the Episcopalians is known as St. Agnes'. Instruction is also given in several charitable institutions. The Albany University, incorporated in 1852, was designed to furnish additional facilities to graduates of American colleges. Union University, located in Schenectady, has three departments in Albany—the law school, the medical college, and Dudley Observatory, which was opened in 1856. The latter (incorporated in 1852) has a 13-inch equatorial telescope, an exceptionally fine library, and other appliances which entitle it to the first rank among similar institutions. The Albany Institute for the Advancement of Science was founded in 1791; it has a valuable library, and its *Transactions* are widely circulated. The Young Men's Association (founded in 1835) and the Young Men's Christian Association (1857) have good libraries. The benevolent institutions are—Albany Hospital, Child's Hospital, St. Peter's Hospital, City Homœopathic Hospital, and Eye and Ear Infirmary. Among the prominent buildings are the Merchants' Exchange, the Museum, Music Hall, Leland Opera-house, Tweddle Hall, Kenmore Hotel, Delavan House, Stanwix Hall, and the new U. S. Government building. The latter, erected at a cost of $500,000, contains the post-office, customs offices, U. S. courts, etc.

When Albany became the permanent capital of the State in 1797, a State hall was erected on the site of the present Geological Hall. This was known as "Jay's Hall," and was the headquarters of the "Albany Regency" under Martin Van Buren. In 1806 the legislature passed a law which authorized a partnership with the city and county of Albany in the erection of a public building on "Pinkster Hill," and funds were raised to the extent of $175,000, mainly by lotteries. This building, known as the "Old Capitol," is now (1883) entirely deserted by the State and awaits an early demolition. The building was first occupied by the city, county, and State in 1809, but in 1830 the State purchased the shares of the city and county, and they removed to the new city hall in 1833. "Jay's Hall" having passed its usefulness, a new State hall of Sing Sing marble was erected in 1833 at a cost of $350,000. The various State departments and officers occupied the building until their removal to the new Capitol. The State Museum of Natural History, now in Geological Hall, seeks the State hall as a repository. Geological Hall is in the care of the regents of the university, and within its walls are the rooms of the State Agricultural Society, together with collections of great scientific value. The State library, also in charge of the regents, occupies a fire-proof building at the rear of the old Capitol and adjoining the same. The library contains over 100,000 volumes, the law section on the lower floor being the most valuable. The large upper room contains a large number of Revolutionary relics—the André papers, private papers of Gen. Washington, etc. The State arsenal and the executive mansion are situated in South Engle Street.

In 1865 the legislature authorized the building of a new Capitol, and the corner-stone was laid some 300 feet in the rear of the old Capitol, June 24, 1871. The first appropriation, that of 1867, was $250,000, and the total cost was estimated at $4,000,000. More than $2,000,000, however, were expended on the foundations and basement-walls alone. Appropriations have been made annually, until the sum-total is over $14,000,000, including the cost of the land, and the entire cost of the completed structure is estimated at $20,000,000. The front, of 290 feet, is toward the east. The north and south sides, 390 feet each, are on Washington Avenue and on State Street respectively. The area covered by the extreme outer walls is over three acres. The building is thoroughly fire-proof, the window-frames being of iron, and door-frames being rendered unnecessary by reason of the swinging of the doors on pivots. Wooden floors are laid over the brick arches in the rooms, but all the corridors and vestibules are laid with encaustic tiles or squares of marble, and the walls bear a wainscoting of similar material. The corridors of the basement and of the first story run through all four sides of the building. The inner rooms look out upon an extensive courtyard, which shows four granite fronts almost as elaborately built as are the various exteriors, and terminating in steep slated roofs pierced with dormers that contain the arms of the Van Rensselaer, Stuyvesant, and other of the old Dutch families. The first story contains the executive apartments and the rooms of the secretary of state and other State officers. In the second story the assembly chamber occupies the space between the outer and the court walls at the middle of the north side. The floor of this room is 60 feet above the sidewalk, and the room itself is 90 feet square. Four columns of Scotch granite 5 feet in diameter are placed toward the centre of the room. Groined arches spring from the capitals of the four columns. These arches support a ceiling of cream-colored sandstone decorated with carvings and inlaid with blue, red, and gold. The weight of this ceiling has proved so great for the columns that it has been proposed to substitute a wooden one. The walls of the room are of the cream-colored stone. The desks of the speaker, clerk, and members of assembly, the chairs, railings, etc., are of solid mahogany. Abundant light enters through windows that look out from the floor both to the north and to the south, and also from a line of arcaded windows above. The spaces between the rows of windows are to be filled with allegorical panels in bronze or marble. The lunette over the arcaded windows on the north side is filled with Hunt's painting of The Flight of Night; the lunette on the south side contains the companion-piece, also by Hunt, entitled The Voyage of the Discoverer. The expense of these paintings to the State was $20,000. The senate chamber, 54 feet square and 50 feet high to the oaken ceiling, occupies the position corresponding with the assembly chamber on the south side of the Capitol. The walls are of Tennessee marble, Mexican onyx, and gilt leather. The recessed galleries are supported by elaborately carved columns *in antis*. The chamber vies with that of the assembly in the richness of its furnishings. Other apartments are reserved for the use of the State library, the court of appeals, etc. Elevators give a quick passage to all parts of the building, while those who prefer to walk can take the north stairway of solid stone, which is considered by many as the most beautiful feature of the interior. (See pl. VI, ARCHITECTURE.)

Albany is practically at the head of navigation on the Hudson River, which at this point rises and falls a foot with the tide. As a U. S. port of survey its importance is vastly increased by its being the terminus of the Erie and Champlain canals. Steamers run to Troy, Poughkeepsie, Newburg, New York (day and night lines), and other points. River-navigation usually opens in March and closes in December, and the record kept since 1824 shows a yearly average of 275 days of navigation, the highest number being 308 and the lowest 221.

Three bridges span the river. The upper or wooden bridge (opened in 1866) is 1953 feet long, and is used for freight-trains only. The middle bridge, of iron, 1014 feet long, is used for passenger-trains and also for foot-passengers. The lower bridge, also of iron, opened in 1882, has a double-track draw of 401 feet.

A number of ferries also give facilities for reaching East Albany on the opposite bank of the river. Large basins and slips at the terminus of the canals have made Albany the largest lumber-market in the State, and this business is supervised by a board of lumber-dealers. The Board of Trade has an oversight of the extensive grain-business of the city. Large quantities of cattle are transferred and sold at the stockyards in West Albany. The principal railroads centring here are—the New York Central and Hudson River, from New York to Buffalo; the New York and Harlem; the Boston and Albany; the Albany and Vermont, for places in Vermont; the Albany and Susquehanna, leading to Binghamton and noted resorts; the Rensselaer and Saratoga, for Troy, Saratoga, Plattsburg, and Montreal. The railroad along the west bank of the Hudson from New York, known as the "West Shore road," leaves the river above Athens, but Albany is connected with it by a branch from Coeymans. The leading manufactures are—ale, aniline colors, boots and shoes, boilers, boxes, bricks, bridges, carriages, clothing, candles, cigars, flour, files, furniture, jewelry, machinery of all kinds, oils, oil-cloths, paper collars, pianos, safes, soap, sewing-machines, stoves and hollow-ware. There are also extensive foundries, blast-furnaces, rolling-mills, and planing-mills. Four national banks, 5 other banks, and 7 savings banks accommodate the business interests of the city. About 4 miles to the north the Rural Cemetery, of 250 acres, is attractively laid out upon the slope toward the river. Adjoining the Rural Cemetery is that of St. Agnes (Catholic). To the south of the city a number of handsome suburban residences follow the course of the Hudson for several miles.

In 1609, Hendrick Hudson, in his attempt to discover the north-west passage, gave up his project in despair when he found the head of navigation to be just above the site of Albany; but other Dutch adventurers explored the river and established a trading-post, guarded by a fort, on what is now called Castle Island, just below the city. Two other forts were erected on the shore, but these defences being rendered useless by the spring freshets, they were abandoned for the more substantial Fort Orange, or Aurania, erected in 1623 on a spot which is now on State Street Hill, nearly opposite St. Peter's Church. Under the Dutch régime Albany was known as Fort Orange, New Orange, Beverwyck, and Williamstadt. The principal trade was in beaver-skins, for the securing of which friendly terms were arranged with the Iroquois to the exclusion of the French. The country about Albany for twenty-four miles square on either side of the river was tributary to the patroonship of the Van Rensselaer family, whose manor-house still stands in North Broadway. The successive patroons held under a kind of feudal tenure that was not abolished till 1787. The last of the patroons died in 1837. Very few relics of the old Dutch days survive to the present day. The Staats house. the Visscher house, and the old Schuyler mansion are the only residences that remain. The Vanderheyden Palace, the Lydius house, the "gable-enders," built of bricks "brought over from Holland," the churches and market-houses, all have disappeared, but they have been preserved in Irving's *Knickerbocker's History of New York*. In 1664 the Dutch surrendered the whole of New Netherland to the English, who named New Amsterdam New York, and Fort Orange Albany, in honor of the duke of York and Albany, who had just received a grant of the whole province from his brother, Charles II. Albany was made one of the original ten counties in the province in 1683. The limits then extended east to the Green Mountains in Vermont, and south as far as Ulster county. The great bulk of this territory was subsequently given up to the State of Vermont and to various counties in the State of New York.

Albany ranks as the oldest incorporated city in the United States, a charter to that effect having been granted in 1686. Its strategic importance was early shown by the crossing of the Indian trails from the east to the west and from the north to the south. Here the governors of New York and Virginia concluded a lasting peace with the Iroquois in 1684. Hither also came, in 1754, a convention of representatives of the different colonies, which, under the lead of Benjamin Franklin, prepared a plan of confederation that was so closely followed two decades later as to entitle Albany to the name bestowed upon it by Pres. Garfield, "the birthplace of the American Union." Although the strategic importance of the place was great, and although its primitive defences were the laughing-stock of the French within their stone walls at Ticonderoga and Crown Point, yet no serious attempt was made to capture the city. Its very importance and its convenient distance from New York and New England proved to be its safety, and no immediate danger was entertained till the British general Burgoyne, before his surrender in 1777, made it his objective point on his way to capture the city of New York. After the adoption of a State constitution by New York in 1777, Albany shared with Kingston, New York, and Poughkeepsie the honor of being the capital till 1797, when it was made the permanent capital. The State for several years occupied a portion of the old city hall or Stadt Huis.

According to the first U. S. census in 1790, the population of Albany was 3506; in 1850 this had increased to 50,763, and in 1880 to 90,903. It is now (1883) estimated at 95,000. Albany is thus the twenty-first city in the United States. (F. G. M.)

ALBANY, the county-seat of Linn co., Or., is on the east bank of the Willamette River, 81 miles south of Portland. The Oregon and California Railroad passes through the town. It has a court-house, a bank, three weekly newspapers, seven churches, and a high school. The valley of the Willamette is fertile and abounds in romantic scenery. Population of Albany, 1867.

ALBATROSS, a large, long-winged oceanic bird of the family *Procellariidæ*, sub-family *Diomedeinæ*, genera *Diomedea* and *Phœbetria*. The name is a corruption of the Portuguese *alcatraz*, a pelican, cormorant, or other large sea-fowl, and is said to have been first used in this form and application by Dampier, who died in 1712; perhaps it is of Arabic origin. The albatrosses are distinguished from other *Procellariidæ* by having the tubular nostrils separated and the hind toe rudimentary, consisting of only one phalanx. They are among the largest of sea-birds, and noted for their volitorial powers, being able to sail for hours without visible motion of the wings and regardless of currents of air. This kind of flight has long been the subject of speculation as well as of more exact investigations, but scientific observers are not yet agreed upon its mechanics. The universal superstition attaching to these "wanderers of the deep" has been embodied with the utmost effect in Coleridge's "Ancient Mariner." They are apparently independent of land, to which they scarcely resort, except to breed, laying a single white egg in a rude nest upon the ground. When incubating they are so apathetic as sometimes to allow themselves to be knocked over with a stick. They are very voracious, and often follow in the wake of a vessel for many miles to secure the refuse of the cook's galley; under these circumstances they are readily captured with hook and line. When taken on board they stand or walk with difficulty, and attempt to defend themselves by biting with their powerful hooked beak and ejecting an oily substance from the mouth or nostrils. There are several species of albatrosses: Dr. Coues's monograph describes eleven, two of them doubtfully (*Proc. Phila. Acad.*, 1866, p. 172), and one or two others have since been named. They are inhabitants of the Pacific and Southern oceans at large, only three reaching high northern latitudes in the former. The largest, best known, and most widely diffused is the wandering albatross, *D. exulans*, which has a spread of wing of 8 to 10 feet, and is mostly white. *D. brachyura*, *D. nigripes*, and *Phœbetria fuliginosa* are the North American species; the first of these resembles *D. exulans* in color; the others are sooty or dark brown. *D. melanophrys*, *cauta*, *culminata*, and *chlororhynchus* are the better-known species of southern oceans. (E. C.)

See Vol. I. p. 398 Am. ed. (p. 449 Edin. ed.).

ALBEMARLE SOUND, in the north-eastern part of North Carolina, extends east and west nearly on the parallel of 36° N. lat., and between 75° 46′ and 76° 40′ W. long. At its N. E. corner it is joined by Currituck Sound, and at its S. E. corner by Croatan and Roanoke sounds, these latter being separated by Roanoke Island (the site of Sir Walter Raleigh's ill-fated attempts at colonization, 1584–90). An intervening narrow strip of sandy beach, running N. N. W. and S. S. E., separates all these interior waters from the Atlantic Ocean, and is broken at intervals by inlets liable to be closed by sand-drift. The usual communication from Albemarle Sound to the ocean is made through Croatan Sound, and through Pamlico Sound, which joins it on the south, and thence through Hatteras Inlet. The extreme length of Albemarle Sound is about 52 miles; the width is very irregular, being about 7½ miles at its mouth, and in other parts varying from about 4 to 14 miles, the mean width being somewhat less than 9 miles. The depth of water is from 13 feet to 21 feet, the western end being deeper than the eastern. The shores are flat, and in places swampy, and generally heavily wooded. The rivers emptying into it are—at its western end, the Roanoke and the Chowan; on the northern shore, the Perquimans, Little River, Pasquotank, and North River; on the southern shore, the Scuppernong and Alligator River. The latter may rather be looked upon as a narrow extension of the sound southward, running up to the great Alligator Swamp.

There are no regular (lunar) tides in the sound, the variation of level being due to the pressure of the winds in an easterly or westerly direction. The water is nearly fresh, and is drinkable. It is occasionally frozen over in very severe winters. The fisheries are very extensive; in the spring and early summer immense quantities of shad and alewives (commonly called herring) are obtained over all parts of the sound, but especially near the mouths of the Chowan and Roanoke rivers. North Carolina ranks highest (census of 1880) of all the Southern Atlantic States in its aggregate catch of herring, and although its catch of shad is somewhat less than that of Maryland, the highest on the list, yet from its being earlier brought into market the money obtained is more than double that from the Maryland fishery. The mean annual temperature over and around Albemarle Sound is about 59° Fahr. (summer mean, 75°; winter mean, 44°); the annual rainfall is about 50 inches.

The first permanent settlements, chiefly by persons from Virginia, were made at the western end of this sound and along its northern shore in the year 1653. The whole of that area north-east of the Roanoke River was at first called the county of Albemarle, the name being given in honor of Gen. George Monk, duke of Albemarle, who was one of those named in the original charter of the province of Carolina, granted by Charles II. in 1663. The population of the nine adjacent counties, in 1880, was 73,600.

Two systems of canal communication join the waters of the Chesapeake Bay with those of Albemarle Sound: the Dismal Swamp Canal, ending in the Pasquotank River above Elizabeth City, and the Chesapeake and Albemarle Canal, connecting with the upper part of Currituck Sound, and thence across a neck of land into North River at the eastern end of Albemarle Sound. (W. L. N.)

ALBERI, Eugenio (1817–1878), an Italian writer, was born at Padua in 1817, and educated in the university of that city. After his graduation he became an active author, principally on historical subjects, and published several works of much importance which have given him a high standing among the modern Italian authors. We may name the following: *Guerra d'Italia del principe Eugenio di Savoia* (1839; 2d ed. 1840); *Vita di Caterina de Medici* (1838); and in 1843 he edited Galileo's works, with a commentary. This publication was placed in the *Index*. The same year he founded the *Annuario Storico universale*. Disappointed in his hopes of a professorship at Florence in 1859, he deserted the Liberal for the reactionary party, and spent his later years in neglect and obscurity. His death took place in June, 1878.

ALBERT EDWARD, Prince of Wales, the heir-apparent of the British throne, was born in Buckingham Palace, London, Nov. 9, 1841. He is the eldest son, but second child, of Queen Victoria and Prince Albert. Besides the title by which he is commonly known, he holds the titles of duke of Cornwall and Rothsay, earl of Chester, Carrick, and Dublin, baron of Renfrew, lord of the Isles, etc. He attended the Universities of Oxford and Cambridge, and has received from them the degrees of D. C. L. and LL.D. He is also chancellor of the latter university. He has been admitted to the bar, and is a bencher of the Middle Temple. He is a field-marshal in the army, and colonel of three regiments. In 1860 he visited Canada and the United States, being accompanied by the duke of Newcastle. In 1862 he made a journey to Egypt and Palestine, being attended by his chaplain, Rev. A. P. Stanley, afterwards dean of Westminster. He was married March 10, 1863, at Windsor, to Princess Alexandra, eldest daughter of Christian IX., king of Denmark. In 1871 he was attacked with typhoid fever, produced by defects in the sanitary arrangements of his new residence at Sandringham. Profound anxiety was felt throughout the British dominions, and public prayers were offered for his recovery. When he was restored to health a day of public thanksgiving was appointed, Feb. 27, 1872, and the queen returned thanks in St. Paul's cathedral, London. In order that the prince might see the vast empire of India, a tour was arranged for him in 1875. Leaving London Oct. 11, he passed by the most direct route to Bombay, which he reached Nov. 8. He remained in India till the 11th of March following, visiting all the principal cities, and was received with great enthusiasm by the natives. He was accompanied by the duke of Sutherland and other noblemen, and Sir Bartle Frere, who had formerly been governor of Bombay. Mr. W. Howard Russell, the distinguished journalist, has published a full account of the tour (London, 1877). The prince usually resides at Marlborough House in London, at Sandringham, at Birkhall, Aberdeenshire, or at Frogmore near Windsor. He has five children, two princes and three princesses. His eldest son, Albert Victor, was born at Frogmore Lodge, Jan. 8, 1864.

ALBERT LEA, the county-seat of Freeborn co., Minn., is 12 miles north of the Iowa State line and 100 miles south of St. Paul, on the Southern Minnesota division of the St. Paul and Milwaukee Railroad. It is also on the Minneapolis and St. Louis Railroad, the Burlington and Cedar Rapids Railroad, and the Albert Lea and Fort Dodge Railroad. It has a court-house, an opera house, three banks, three weekly newspapers (one Scandinavian), nine churches, good schools, a foundry, flour-mill, three wagon-factories, and a plough-factory. It is beautifully situated between two small lakes. It was settled in 1857, and incorporated as a city in 1880. Population, 1966.

ALBIA, the county-seat of Monroe co., Iowa, is 100 miles west of Burlington and 68 miles S. E. of Des Moines, on the Chicago, Burlington, and Quincy Railroad, the Iowa Central Railroad, and the Chillicothe and Chariton Railroad, and is a terminus of the Albia, Knoxville, and Des Moines Railroad and of the Albia and Moravia Railroad. It has a court-house, opera-house, three hotels, two banks (one national), three weekly newspapers, six churches, a high school with fine building, and a graded school. It has a foundry, two grist-mills, a creamery, and a brickyard. It is well laid out, and has a park. It is free of debt, its property is valued at $441,000, and its yearly expenses are $3250. It was settled in 1843—was incorporated as a town in 1854 and as a city in 1874. It is surrounded by an extensive bituminous coal-region, and inhabited by thrifty people, chiefly of American birth. Population, 2435.

ALBINO (Lat. *albus*, white), noting a condition of animals in which parts or tissues ordinarily colored are white, or the individuals so affected. The state is also called *albinism*, of which the adjective is *albinotic*, or *leucism* (Gr. λευκός, white). This affection is much more frequent than its opposite, *melanism*. It may be partial or entire. In the latter case not only is the integument, with its appendages, if any, as hair, fur, or feathers, devoid of color, but the choroid coat of the eye lacks pigment, and therefore appears pink, the color of the blood in the choroid vessels. It is occasionally observed in colored races of the human species as an abnormality; some races are normally albinotic to a degree. The most familiar instance is afforded by the domestic breed of perfectly white pink-eyed rabbits. Any animal may exhibit it, as an individual peculiarity, without disease or manifest impairment of vitality. In birds it is very frequent, the list of species in which partial or entire albinism has been observed including a large proportion of the species so well known that many individuals have come under the observation of naturalists. It occurs as often as elsewhere among species which are normally black, as crows and blackbirds. The cause or conditions of albinism not having been determined, it must continue to be regarded simply as a *lusus naturæ*. The freak has always excited the astonishment of the vulgar, and with some savages individuals so affected have been regarded with veneration, while white deer and other large game are commonly supposed by hunters to bear a charmed life. (E. C.)

See Vol. I. p. 402 Am. ed. (p. 455 Edin. ed.).

ALBION, an incorporated village of Calhoun co., Mich., is on the Kalamazoo River, at the junction of the Michigan Central Railroad and the Lansing branch of the Lake Shore and Michigan Southern Railroad, 96 miles west of Detroit. It has three banks (one national), four hotels, three weekly newspapers, six churches, five schools, and is the seat of Albion College, which was founded in 1860 and is under control of the Methodist denomination. Albion has three flour-mills, one of which is very large, a foundry, and manufactures of agricultural implements and windmills. It was settled in 1836 and incorporated in 1855. It is surrounded by a fine farming country, and presents a fine appearance. Its property is valued at $2,000,000; its public debt is $7000, and its expenses for the year 1881 were $4500. The inhabitants are mostly of American birth, though one-third are Germans. Its population in 1880 was 2716, and it is now (1883) over 3000.

ALBION, the county-seat of Orleans co., N. Y., is on the Erie Canal, 10 miles south of Lake Ontario and 30 miles west of Rochester. The New York Central Railroad passes through the village. It has a court-house, jail, opera-house, and public halls. There are four hotels, three banks (two national), three weekly newspapers, six churches, a union school, and three academies. The industrial works comprise three flour-mills, a foundry, an agricultural-implement factory, iron-pump factory, three saw-mills, a furniture-factory, heading factory, sash-and-blind factory, and a boatyard. The village is well built, is lighted with gas, and has a park. It was settled in 1812 by immigrants from New England, and was incorporated in 1828. Its property is valued at $3,841,000; its public expenses for 1881 were $16,500, and it is free of debt. In the vicinity are extensive quarries of sandstone of fine quality. Population, 5147.

ALBONI, MARIETTA, a distinguished Italian contralto singer, was born at Cesena, March 10, 1822. At an early age she showed a great talent for the acquisition of languages and a passion for singing. She received an excellent general education, and studied music in Bologna, where she attracted the attention of Rossini, who interested himself in her advancement and procured her an engagement at the Teatro Communale of that city. At the age of twenty Alboni made her first appearance there as Maffeo Orsini in Donizetti's *Lucrezia*. After singing for four successive seasons at La Scala, Milan, she began a triumphal artistic tour, visiting Vienna, Russia, Belgium, Holland, and Prussia, and in the spring of 1847 made her first appearance in London at Covent Garden Theatre. Although the famous Jenny Lind was then the reigning songstress, Alboni (in company with Grisi and Persiani) gave such an impersonation of Arsace in *Semiramide* as to become at once an established favorite. In the autumn of the same year her triumphs were renewed in Paris, where she immediately wrung from the most jaded critics enthusiastic praise, and greatly delighted celebrated musicians, including Berlioz and Meyerbeer. Having won all hearts in Europe, Alboni came to the United States in 1852, and visited all the principal cities, appearing in operas, concerts and oratorios. In 1854 she married the Count di Pepoli, and after his death, in 1866, she retired into private life. In 1869 she went to Paris to sing in Rossini's posthumous Mass, and in 1872 she reappeared there in opera.

The best region of her voice was the lowest portion (from E flat to F). The second register extended to the F above. Beyond this point a third register began, which is said to have reached high C sharp. Alboni's style of singing was not marked by violent contrasts or exaggerations. On the contrary, the tones were exquisitely pure and musically correct, whatever the intensity of the dramatic situation. All her efforts were marked by artistic moderation and restraint, and yet she commanded the most rapt attention. A genial countenance, bewitching smile, graceful movements, and symmetrical figure combined with other charms to make her stage-presence almost as attractive as her voice and singing. (S. A. P.)

ALBUQUERQUE, the county-seat of Bernalillo co., N. M., is on the east bank of the Rio Grande River, 56 miles S. W. of Santa Fé. It is on the Atchison, Topeka, and Santa Fé Railroad, and is the terminus of the Atlantic and Pacific Railroad, having the offices, car-shops, and round-houses of the latter road. The St. Louis and San Francisco Railroad also has commenced building its road from this place. Albuquerque has gas-works, water-works, a street railway, telephone exchange, six hotels, an opera-house, two weekly newspapers, and is the business-centre of a rich mining territory. It has an iron-foundry and some manufactures. It is 5200 feet above the sea-level, and within ten miles of the Sandia Mountains. It has grown rapidly within a few years, and two-thirds of its inhabitants are from other parts of the United States. Population, 2315.

ALCEDINIDÆ (Lat. *alcedo*, a kingfisher), a family of non-passerine insessorial birds, belonging to the Picarian group, including the kingfishers. In these birds the bill is long and large, with ample gape (fissirostral), but of different shapes in the various genera. The tongue is very small. The feet are extremely small and weak, scarcely adequate to progression; the birds move little except by flying. The foot is also peculiarly constructed, two of the front toes, of unequal lengths (anisodactyl), being united together for a long distance, constituting the type of foot called syngnesious. Sometimes one of the front toes is rudimentary, as in the genera *Ceyx* and *Alcyone*. The whole family is divisible into two sub-families, the *Alcedininæ* and the *Daceloninæ*. The former are the true "kingfishers," subsisting chiefly upon fish, which they capture by hovering over the water and plunging down on wing; they nest in deep burrows which they excavate in the ground, and lay numerous sub-spherical eggs of crystalline whiteness and smoothness. The few American *Alcedinidæ* are all of this sub-family, and of the single genus *Ceryle*. The common North American kingfisher, *C. halcyon*, is the best known of these. The *Daceloninæ* are less aquatic, or not at all so; they feed upon reptiles, molluscs, and insects, and nest in holes in trees; they all belong to the Old World, and constitute an assemblage of numerous genera and species, some of them remarkable for the brilliancy of their coloration. The leading authority upon the family is R. B. Sharpe's *Monograph of the Alcedinidæ* (London, 4to, 1868–71). This gives 5 genera and 41 species of *Alcedininæ*, and 14 genera and 84 species of *Daceloninæ*. (E. C.)

ALCIDÆ (name derived from AUK, which see), a family of sea-birds related to divers and petrels; it may be thus defined:

Feet palmate, three-toed, the hallux wanting. Feet short, placed very far back, scarcely fitted for progression on land, but very efficient in the water; tarsi reticulate or partly scutellate; tibio-tarsal joint naked. Bill of wholly indeterminate shape, often curiously distorted, and in many cases its horny covering *deciduous*, being moulted regularly like the plumage. Wings short and narrow; tail short, rounded or pointed. Body stout, thick-set. No tibial apophysis, as in *Colymbidæ*. Carotids generally double (single in *Alle*). Cœca coli and ambiens muscle present; accessory semi-tendinosus absent. Oil-gland present, tufted. Palate schizognathous; nasal bones schizorhinal. Nature altricial and ptilopædic; eggs few or single.

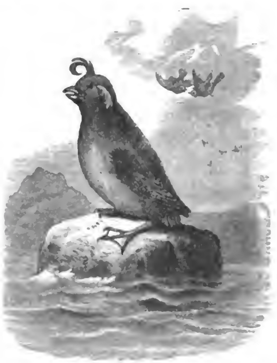


FIG. 1.—Curl-crested Auk. *Simorhynchus cristatellus*

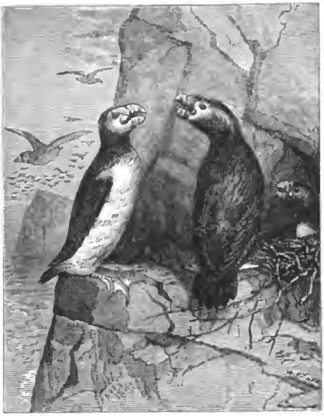


FIG. 2.—Left-hand fig., Horned Puffin, *Fratercula corniculata*; right-hand fig., Tufted Puffin, *Lunda cirrata*.

The numerous species of *Alcidæ*, of several genera, are confined to the northern hemisphere, where they replace the penguins of the southern. Some representatives of the family have been found as far north as explorers have penetrated, but the majority live in more temperate regions. The species are to some extent migratory, straying southward in the autumn, sometimes to a considerable distance, and in the spring repair again to the north to breed; but a few appear to be stationary upon their nesting-grounds. The most southern point reached is about 21° N. on the Pacific coast of North America; but this is exceptional. The species are very unequally divided between the two oceans, the Atlantic having few representatives compared with the Pacific, where the family focuses in numbers of species, though the individuals are not more numerous than on the Atlantic shores; few are common to both. The auks are exclusively marine, and highly gregarious, especially during the breeding-season, when some of the species congregate in myriads on rock-bound coasts. Usually one, often two, rarely three, eggs are laid upon the bare ledges, in rocky crevices, or in burrows under ground. The young cannot fly for a period, being nourished with food brought to the nest by the parents.

Birds of this family are unique, as far as known, in that they have a regular moult of the horny covering of the beak after the breeding-season, recovering the shed portions before the next breeding-season by a new growth from the soft basement, which is exposed ad interim. The singularity of the shape and color of the beaks of many species of *Alcidæ* had often occasioned remark before 1877 and 1879, when the French naturalist, L. Bureau, showed that the most outré configurations and bizarre colorations resulted from the development of the deciduous plates of horn during the nuptial season. (See *Bull. Soc. Zool. de France*, 1877, pp. 1–22; 1879, pp. 1–68.) This curious phenomenon is confined mainly or wholly to the species of the subfamily *Phaleridinæ*; in the genus *Fratercula*, in which the horn of the beak is shed in *nine* separate pieces, the process extends to the horny excrescences upon the eyelids, which are lost and recovered in the same manner. Probably the nearest approach to this is made by the white pelican, *Pelecanus trachyrhynchus* of North America, which similarly sheds the "centre-board" excrescence which is developed upon the upper mandible in the breeding-season.

All the species of this interesting family being North American, the following analytical characters of the sub-families and genera are given:

Sub-family PHALERIDINÆ. Nostrils naked, remote from feathers. Bill of variable shape, but always compressed, higher than wide, and as far as known appendaged with deciduous horny elements. Head nearly always crested. No great seasonal changes of plumage.

Fratercula. Eyelids with deciduous appendages. No crests. Bill extremely high and thin; culmen with one curve; both mandibles grooved; a rosette at angle of mouth; covering of bill moulted in seven to nine pieces. Two species: *F. arctica*, Atlantic; *F. arctica* var. *glacialis*, Polar; *F. corniculata*, Pacific.

Lunda. Eyelids simple. Long lateral crests. Bill extremely high and thin; culmen with two curves; upper mandible grooved, under smooth; a rosette at angle of mouth. Covering of bill moulted in seven pieces. One species: *L. cirrata*, Pacific, and casually Atlantic.

Ceratorhina. Eyelids simple. Lateral crests. Bill with a deciduous horn at base of upper mandible. No rosette. Neither mandible grooved. Covering of bill moulted in two pieces. One species: *C. monocerata*, Pacific.

Simorhynchus. Eyelids simple. Head variously crested. Bill of indeterminate shape, various parts moulted in one to seven pieces. No rosette. Four species: *S. psittaculus*, *S. cristatellus*, *S. pygmæus*, *S. pusillus*, all Pacific.

Ptychorhamphus. Eyelids simple. Not crested? Bill acute; upper mandible striate; no moult of bill known. One species: *P. aleuticus*, Pacific.

Sub-family ALCINÆ. Nostrils more or less completely feathered. Bill of variable shape, not known to be appendaged with deciduous elements. Head not crested (excepting one species). Seasonal changes of plumage usually well marked.

a. Bill rather elongated, more or less acute, without vertical grooves.

Alle. Nostrils nearly circular, incompletely feathered. Bill short, stout, turgid (for this group). Tarsi scarcely compressed, scutellate in front. One species: *A. nigricans*, Atlantic and Polar.

Synthliborhamphus. Nostrils broadly oval, incompletely feathered. Bill much compressed. Tail nearly even. Tarsus extremely compressed, scutellate in front and internally. Two species: *S. antiquus*, *S. umizusume*, Pacific.

Brachyrhamphus. Nostrils oval, feathered. Bill very small, slender, acute. Tarsi reticulate. Five species? *B. marmoratus*, *B. Kittlitzi*, *B. hypoleucus*, *B. Craverii? B. brachypterus?*

Uria. Nostrils narrow, feathered. Bill about equal to reticulate tarsus. Three species: *U. grylle*, Atlantic; *U. columba*, *U. carbo*, Pacific. Also, *U. Mandti?* Polar.

Lomria. Nostrils narrow, densely feathered. Bill longer than scutellate tarsus. Two species: *L. troile*, Atlantic, with var. *Californica*, Pacific; *L. arra*, Pacific and Atlantic.

b. Bill elongate, stout, high, narrow, vertically grooved. Nostrils linear, densely feathered.

Utamania. Wings developed, fit for flight. One species: *U. torda*, Atlantic, Polar, and casually Pacific.

Alca. Wings reduced in size, unfit for flight. One species: *A. impennis*, Atlantic (extinct). (E. C.)

ALCOCK, SIR RUTHERFORD, K. C. B., was born in London in 1809. He received his principal education at King's College, London, with a view to the medical profession. He became surgeon of the marine brigade in Portugal in 1833–34, and deputy inspector-general of hospitals in the Spanish Legion, under Sir De Lacy Evans, in 1835–36. In 1839 he was appointed a commissioner of the claims of the Portuguese Legion. He began his long period of diplomatic service in the East in 1844 as British consul at Foo-Chow, China. At subsequent dates he held the same office, first at Shanghai and afterwards at Canton. In 1858 he received the appointment of consul-general in Japan, and in 1859 was promoted to be envoy extraordinary and minister plenipotentiary to that country. Here he was subjected to several dangerous assaults from the hostile nobility, the last of which was with difficulty repelled with the aid of foreign troops. In 1865 he was appointed envoy to China and chief superintendent of British trade in that country, and in the same year received the appointment of envoy extraordinary and minister plenipotentiary at Pekin. This position he resigned in 1871. He was made a commander of the order of the Bath on June 19, 1863, and received from the University of Oxford the honorary degree of D. C. L. He is the author of several valuable works, embracing *Notes on the Medical History and Statistics of the British Legion of Spain* (1838), *Elements of Japanese Grammar* (1861), *Familiar Dialogues in Japanese* (1863), *The Capital of the Tycoon, a Narrative of a Three Years' Residence in Japan* (1863), and *Art and Art Industries in Japan* (1878).

ALCOHOLIC BEVERAGES. Liquids containing alcohol in larger or smaller amount are used as beverages throughout the world, both among civilized nations and savage tribes. These represent in all cases the product of the fermentation of some sugar- or starch-containing material, either a sweet fruit-juice or some cereal. They may be classified most simply according to the material producing the alcohol and the general course of treatment to which it is submitted in preparing the beverage. Thus we have—

I. Those beverages which are prepared by the fermentation of malted grain—*beers*, *ales*, and *porters*.

II. Those which are prepared by the fermentation of grape-juice—*wines* properly so called.

III. Those which are prepared by the fermentation of the juices of fruit other than the grape—*cider* and *fruit-wines*.

IV. Those which are prepared by the distillation of some fermented saccharine liquid—*ardent spirits*, like *brandies*, *rum*, *whiskey*, etc.

Beer, *ale*, and *porter* are made from malted grain (see article on BREWING, Vol. IV.), which has been fermented and is then flavored with hops. They contain several alteration products of the original starch of the grain, such as dextrine, maltose (or malt-sugar), and glucose; alcohol and carbon dioxide, the results of fermentation; and salts derived from both the grain and the flavoring-material added. Their color, which varies from a pale amber to a deep brown, depends chiefly upon the degree to which the malt has been heated in the kiln or drying process, although prepared caramel coloring is sometimes added. The percentage of alcohol in malt liquors varies from 1·5 to 9 per cent., as will be seen from the subjoined table:

Berlin Weiss-beer	1·5–2·0	per cent.
Schenk-bier (winter beer)	3·8	"
Munich lager-bier (summer beer)	5·1	"
Bock beer	4·6	"
Salvator beer (Munich)	5·0–6·0	"
London porter	5·4–6·9	"
Burton ale	5·9	"
Guinness's stout	6·81	"
Allsopp's ale	8·3–9·0	"
Bass's pale ale	8·4	"

The specific gravity of these beverages varies from 1·014 to 1·033.

Wines.—This name is restricted in practice to the product of the juice of the grape. This is fermented under a great variety of conditions, however, and a great variety of wines is the result. Thus, in the manufacture of red wines the *marc*, or skin and seeds, is allowed to remain in contact with the *must*, or juice, during a part at least of the fermentation, in order that the alcohol developed may take up a sufficient quantity of the coloring-matter. If the must be rich in glucose and poor in nitrogenized material, and if the fermentation be arrested before the glucose has been entirely converted into alcohol, a *sweet* wine is obtained; under the contrary conditions a *dry* wine is the result. *Light* wines are those whose alcoholic strength is less than 12 per cent. *Heavy* wines are generally at the same time sweet wines, as these latter are fortified for keeping by the addition of alcohol. *Champagnes* are sparkling and effervescing wines, a quality which is communicated to them by bottling them before the fermentation is completed, thus retaining the carbon dioxide, which dissolves for the time in the liquid, but escapes with effervescence when the pressure is relieved. They are also dry or sweet according to the conditions before stated. Of the still wines, the best known are the *clarets*, or red Bordeaux wines, and the *hocks*, or white Rhine and Moselle wines. The following table will show the percentages of alcohol and grape-sugar in different varieties of wines:

	Alcohol, per cent.		Grape-sugar, per cent.
Port (old bottled)	20·2	(by vol.)	
Port (newly-bottled)	17·4	(by vol.)	
Sherry,	17·89		2·043
Sherry, dry	16·98		·934
Sherry, imitation	16·48		2·23
Marsala	16·38		·275
Madeira	16·12		3·0
Lachryma Christi	17·00	(by vol.)	
Malaga	12·04	(15·87 by vol.)	14·62
Tokay	12·04		15·62
Claret, common	10·44		2·255
" (Château Latour)	9·30	(by vol.)	
" (Château Lafitte)	8·77	(by vol.)	
" (Château Margaux)	8·07	(by vol.)	
Sauterne	10·84		·088
Johannisberger (1842)	8·1	(by vol.)	
Rüdesheimer	9·2	(by vol.)	
Chablis	7·77		·088
Norton's Virginia	9·53		14·62
Catawba	9·61		14·62
Champagne (Carte Blanche)	9·51	(11·75 by vol.)	11·53

Fermented Fruit Beverages.—From the apple and pear juices respectively are gotten by fermentation cider and perry, and from small fruits, like currants, gooseberries, and blackberries, similarly wines bearing the corresponding names. Cider and perry in general characteristics resemble light wines, but are peculiar in containing malic acid. They contain from 2 to 7 per cent. of alcohol, and are very prone to the acetous fermentation on account of the presence of nitrogenous materials from the fibre of the fruit. They therefore very readily become sour and unpalatable on exposure. The several fruit-wines mentioned above are also distinguished from grape-wines by the presence of malic and acetic acids in relatively large, and tartaric acid in relatively small, quantity. The fruit-juice is usually treated with sugar before the fermentation to increase the percentage of alcohol, which, however, at most does not exceed 5 to 10 per cent.

Ardent Spirits.—These are alcoholic beverages, which are prepared from grain, fruit, or saccharine juices by fermentation and after distillation. By this distillation they are freed from the dissolved non-volatile constituents, while they retain all the alcohol of the fermented liquids from which they are prepared. Besides alcohol and water they contain the ethers of acetic, butyric, œnanthic, and pelargonic acids, to which they owe their flavor; frequently tannin and coloring-matter from the wood of the cask; amylic alcohol (fusel oil) where the distillation is imperfect; sugar, specially added, and caramel. This latter material is added to give them their usual dark color, as the products of distillation are colorless. The best-known varieties of ardent spirits are—

Brandy, obtained by the distillation of wine, made chiefly in France, the best variety of which, known as "cognac," owes its flavor and aroma to the presence of ethyl pelargonate and other secondary products of fermentation. When freshly distilled it is colorless, but readily takes up color from the storing casks, and caramel is frequently added to it. Artificial brandy is manufactured by flavoring grain spirit. Among the flavoring agents employed for the purpose are acetate, nitrite, and pelargonate of ethyl; oils of cassia, cloves, and bitter almonds; tinctures of allspice, galls, capsicum, oak-bark, etc.; burnt sugar and other coloring-materials.

Whiskey is prepared from fermented grain (wheat, rye, barley, or Indian corn) or potatoes. The barley or other grain is used either malted or raw, or a mixture of the two is taken. That from malted grain is the most valuable and contains the least fusel oil. American whiskey has a color, due in part to the casks in which it is stored, but in large part to added caramel. Scotch and Irish whiskeys have a peculiar smoky flavor, produced by drying the malted grain by a peat-fire. This is, however, often imitated by adding one or two drops of creasote to the gallon of spirits.

Gin is a colorless spirit distilled from fermented grain and flavored with oil of juniper, or in some cases with oil of turpentine. It is usually very free from fusel oil, tannin, etc. Hollands and schnapps are varieties of gin.

Rum is a spirit obtained, chiefly in the West Indies, from molasses and the residues of the sugar manufacture, whether it be from the sugar-cane or the sugar-beet. The characteristic flavor of rum is due to the presence of ethyl butyrate. An imitation rum is largely prepared by flavoring grain spirit with butyric ether, or even by adding butyric acid, which gradually forms ethyl butyrate by reacting with the alcohol present. The dark rum is colored by caramel.

Liqueurs or *bitters* are nothing more than proof-spirit or alcohol mixed with sugar, plant-extracts, and some aromatic principles, which give them their characteristic names. Thus, absinthe is flavored with wormwood; anisette, with aniseed; curaçoa, with orange-peel; kirschwasser, with the fermented juice of the wild cherry, which contains as a normal constituent a small proportion of prussic acid; maraschino with cherries also; kümmel, with cummin and caraway seeds; noyeau, with oil of bitter almonds from peach and apricot kernels.

The percentage of alcohol in ardent spirits very considerably exceeds that of the heaviest wines, and indeed generally constitutes about one-half of the beverage by volume, as will be seen by the following tables:

Spirits.	Alcohol by vol.	Alcohol by weight.
Scotch whiskey	50·3 per cent.	42·8 per cent.
Irish "	49·9 "	42·3 "
American "	60·0 "	52·2 "
German schnapps	45·0 "	37·9 "
Rum	49·7 "	42·2 "
French cognac	55·0 "	47·3 "

Liqueurs.	Alcohol by vol.	Alcohol by weight.	Cane-sugar.
Absinthe	58·93 per ct.		
Boonekamp or maag bitters	50·0 "	42·5 per ct.	
Benedictine bitters	52·0 "	44·4 "	32·59 per ct.
Anisette de Bordeaux	42·0 "	35·2 "	31·44 "
Curaçoa	55·0 "	47·3 "	28·50 "
Kümmel	33·9 "	28·0 "	31·18 "
Peppermint liqueur.	34·5 "	28·6 "	47·35 "

For a description of the methods of determining the alcoholic strength of different beverages see the article on ALCOHOL (Vol. I.). (S. P. S.)

ALCOHOLS. While the term "alcohol" is restricted in common usage to spirit of wine, or the compound possessing the formula C_2H_6O, from a chemical point of view it is a class name, and common or *ethyl alcohol* is only one of a series known as *alcohols*. An alcohol, then, in the wider sense is an organic compound derived from the hydrocarbons by the replacement of one or more hydrogen atoms by a corresponding number of hydroxyl (OH) groups. It is an organic hydrate, generally basic in character, and is capable of entering into reactions with the acids, just as is the case with the metallic hydrates of inorganic chemistry. Alcohols are *monatomic, diatomic, triatomic*, or even *hexatomic*, according to the number of hydrogen atoms of the original hydrocarbon replaced by hydroxyl groups. Thus, from the hydrocarbon C_3H_8 may be deduced the monatomic alcohol C_3H_7OH, the diatomic alcohol $C_3H_6(OH)_2$, or the triatomic alcohol $C_3H_5(OH)_3$.

See Vol. I. p. 415 Am. ed. (p. 469 Edin. ed.).

The monatomic alcohols are the most important of these classes. They are formed, as already indicated, from the successive members of the paraffin series of hydrocarbons, and are known by names indicating the radical or group characteristic of each as a hydrate. Thus, from—

CH_4 (marsh gas) we get $CH_3.OH$, methyl alcohol (wood spirit).
C_2H_6 (ethyl hydride) " $C_2H_5.OH$, ethyl " (sp. of wine).
C_3H_8 (propyl hydride) " $C_3H_7.OH$, propyl "
C_4H_{10} (butyl hydride) " $C_4H_9.OH$, butyl "
C_5H_{12} (amyl hydride) " $C_5H_{11}.OH$, amyl " (fusel oil).

Of these, methyl alcohol is formed in the destructive distillation of wood as a constituent of the crude wood-naphtha, and in some cases of fermentation; ethyl alcohol is the chief product of the vinous fermentation; propyl and butyl alcohols are found in the last products of the distillation of French brandies, and are produced by the fermentation of the *marc* or grape-skins; amyl alcohol (known in the impure state as fusel oil) is formed in the manufacture of potato and corn spirit.

The diatomic alcohols are of little practical importance. They are sometimes known as *glycols*, because of their sweet taste. The triatomic alcohols are known as *glycerines*, and $C_3H_5(OH)_3$, propenyl alcohol, is common glycerine. It is a sweet, syrupy liquid used in medicine and pharmacy, and is the material from which is prepared $C_3H_5(NO_3)_3$, nitro-glycerine, the basis of dynamite, giant powder, etc.

The hexatomic alcohols, mannite and dulcite, $C_6H_8(OH)_6$, are considered as the bases of the large and important class of the sugars and starch, wood-fibre, and gum.

Still other classes exist, known as aromatic alcohols, derivable from the hydrocarbons of the benzol series.

The alcohols as basic hydrates unite with acids, both organic and inorganic, to form salts known as *ethers* or *esters*. For a description of these and other derivatives see article on CHEMISTRY (Vol. V.). (S. P. S.)

ALCOTT, AMOS BRONSON, an American philosopher, and one of the founders of the school of Transcendentalists in New England, of which his friend Ralph Waldo Emerson has been the best-known exponent, was born at Wolcott, near Waterbury, Conn., Nov. 29, 1799. His ancestors were among the first settlers of that town under the name of "Alcox," and as "Alcocke," the original English name, appear as early inhabitants of New Haven, Conn., and of Roxbury, Mass. Among the English representatives of the name the most distinguished is Alcock, bishop of Ely in the time of Henry VII. The father of Mr. Alcott, Joseph Chatfield Alcox of Wolcott, was a small farmer and mechanic of Connecticut. As a boy Bronson engaged in clockmaking for a year or two while pursuing his education at the common school in the rural town of Wolcott, and later spent several seasons peddling—occasionally school-keeping—in Virginia and the Carolinas. These Southern journeys began in 1819, and ended in 1823, in which year he began school-keeping in Connecticut—at first in Bristol, and then for some years in the town of Cheshire. Here he began, at the age of twenty-six, a reform of the then prevailing methods of early education. His school at Cheshire, in which he first developed his ideas, was described in Russell's *Journal of Education* for Jan., 1828. In June, 1828, he took charge of an infant school at Boston, whither he was invited by persons who had seen and admired his original methods at Cheshire. In April, 1829, he opened a private school in Boston; was married there in May, 1830, to Miss May, a daughter of Col. Joseph May; and in Nov., 1830, removed to Philadelphia, where he opened a school in Germantown, which continued until 1834, when he returned to Boston and opened his famous school at the Masonic Temple, of which Miss E. P. Peabody has written an account (*Record of a School*, Boston, 1835). The improvements in teaching made by Mr. Alcott, who for a time was called "the American Pestalozzi," were in part material and in part intellectual and spiritual, based upon his theories of the mind and soul of childhood, of which he took a Pythagorean view, with a strong bias toward the Platonic doctrine of memory and pre-existence. Mr. Alcott was one of the first to give his pupils single desks (instead of long benches and forms), blackboards, and even slate and pencil for common use. He established a school library, introduced evening amusements and light gymnastic exercises, and laid much stress on the keeping of diaries by his pupils. For severe and indiscriminate punishments he substituted appeals to the moral sentiment and the affections of children, and in general he adopted a kindly and reverent mode of drawing out the child's mind toward knowledge rather than to pour in knowledge by mechanical and compulsory methods. This also was the main feature of Pestalozzi's plan of education, of which, however, Mr. Alcott seems to have known little or nothing until after he had originated a like system for his Cheshire school. Pestalozzi died in Feb., 1827, and it was not until 1837, upon Miss Martineau's return from America, that the most devoted of Pestalozzi's English friends, James Pierrepont Greaves, learned from Miss Martineau what Mr. Alcott had done in New England. Soon afterward Mr. Greaves founded a Pestalozzian school near London, to which, in recognition of the American educator, he gave the name of "Alcott House." Upon his visit to England in 1842, the year that Mr. Greaves died, Mr. Alcott was received with honor at this school, and he afterwards caused to be printed in Mr. Emerson's *Dial* (republished in Boston, 1883) an account of Mr. Greaves and his connection with Pestalozzi. The Temple School in Boston was the last of Mr. Alcott's ventures in the teaching of children; it continued from 1834 to 1837, when it failed in consequence of a public outcry against certain opinions supposed to be inculcated in a remarkable book, *Conversations with Children on the Gospels*, which Miss Peabody compiled from Mr. Alcott's daily talks with his pupils and published at Boston in 1836–37. The two volumes were at once attacked by the Boston newspapers, whose criticism drew from Mr. Emerson an earnest public defence of his friend's book. This, however, had no effect, and when the school of Mr. Alcott had been withdrawn from the Masonic Temple to his own house, its fortunes were still further injured by the readiness of the teacher to receive a colored child as a pupil. He finally abandoned school-keeping in 1839, and in 1840 removed to Concord, where he has lived most of the time since.

In 1837, when Mr. Alcott was so unpopular in Boston, he was regarded not only as a heretic in education and an abolitionist in politics, but also as the leader of the Transcendentalists, then a new and much-ridiculed company of philosophers. Soon afterward Mr. Emerson came to be recognized as the Transcendentalist leader, but both he and Mr. Alcott, who was three years older, had been from childhood followers of the doctrine then miscalled Transcendentalism, which was more properly a form of spiritual idealism, having but little in common with the German philosophy in which the term "Transcendental" was usually employed. With Mr. Alcott, who had small scholarship in its ordinary sense, and whose thinking was not so much methodical as identical, repeating again and again the same idea or sentiment, with some change of phrase, the word "mysticism" perhaps best describes his attitude. He sought those inner states of mind which are favorable to self-communion and to the utterance of devout feeling, and from these he spoke to such as would hear him—at first to children, and then, by way of conversation, with circles of older persons. Margaret Fuller held conversations somewhat similar about the same time, and indeed was for a while connected with Mr. Alcott's Boston school, which may have suggested to her the conversational form of discourse. But it was Mr. Alcott who carried this form to its greatest development, and for many years after 1839 pursued the method of conversation in his public instruction, while Mr. Emerson, in a much larger field and to audiences more various, taught his philosophy in lectures. In later years Mr. Alcott also lectured widely, but he still preferred the method of conversation, and introduced it as a fundamental part of the system pursued in the summer gathering known as the "School of Philosophy" at Concord, Mass., which meets for a few weeks each year in Mr. Alcott's orchard. In the period from 1837 to 1845 he sought to give practical effect to his opinions concerning society and simpler modes of living, by withdrawing from the institutions of State and Church and founding communities in which labor and property should be more nearly equalized than he had seen them. In Jan., 1843, while living in Concord, Mass., he refused to acknowledge the authority of the State by paying taxes, and was imprisoned in the jail until his neighbors paid his tax. In the same year he joined with an English friend, Charles Lane, in opening a small community at a place called "Fruitlands" in Harvard, Mass., but the experiment failed and left Mr. Alcott in poverty. He returned to Concord in 1844, where he lived a rural life, as he had done before, gardening and philosophizing by turns, and intimately associated with Emerson, Hawthorne, Thoreau, Channing, and the other idealists of that town. In 1858 he became superintendent of the public schools in Concord, and spent much time in making them conform to the ideal system of education in his own mind. Since 1879 he has been dean of the Concord School of Philosophy, and converses daily there during its summer sessions.

Mr. Alcott has written copiously for many years, but published few books until he had reached the age of seventy. He wrote "Orphic Sayings" for the *Dial* (1840–44), and in 1858–61 wrote school reports; but his first volume, *Tablets*, appeared in 1868. This was followed by *Concord Days* in 1872, *Table Talk* in 1877, *New Connecticut* in 1881, and *Sonnets and Canzonets* in 1882. Later in that year he published a monody on the death of Emerson, and reprinted an essay on Emerson which had been privately printed in 1865. The poems published in 1881–82 are noticeable as having all been written since the author completed his eightieth year, and are portions of an autobiography which he has been composing in verse and prose. In a sketch of Mr. Alcott written many years before his own death, Mr. Emerson said of him: "He attaches great importance to diet and government of the body; still more to race and complexion. He is an idealist, and we should say Platonist if it were not doing injustice to give any name implying secondariness to the highly original habit of his salient and intuitive mind. He has singular gifts for awakening contemplation and aspiration in simple and cultivated persons; a deep and subtle science of that which actually passes in thought; and thought is ever seen by him in its relation to life and morals. Those persons who are best prepared by their own habit of thought set the highest value on the subtle perception and facile generalization of this peripatetic philosopher." In his later discourses Mr. Alcott has placed himself distinctly on the side of Christianity, though maintaining its essential doctrines with some variations from their common theological form. He holds, like the Neo-Platonists, that men have been born into this world by descent or lapse from a former life, retaining here certain reminiscences of that pre-existence. In contradiction of the modern doctrine of development upward, he therefore holds that the animals descend from man, or through man from God, by a sort of metempsychosis, which suggests Pythagoras and the Orientals, the universe being supported from above, as bees depend from the queen. He believes that God is a person, manifesting himself in a threefold being; that men also have this threefold being, and partake of the divine *personality*, as distinguished from *individuality*, which is their human inheritance; that faith is derived and maintained by inward perception, to which all outward revelation must correspond. His distinction between personality and individuality, though different in expression, is in substance the same as that drawn by Aristotle and by Hegel, but is not derived from those philosophers. His theories of vegetable diet and of select souls are akin to those of Pythagoras. The School of Philosophy established by him is hospitable to Hegelianism as well as to his own form of idealism, which many persons find vague and formless.

Mr. Alcott was attacked with apoplexy, Oct. 24, 1882, at the home in which he has lived for some years (the house where Thoreau lived and died), and where his whole family of children and grandchildren, including Miss Alcott the novelist, his daughter, are members of his household. This attack came soon after his finishing *Ralph Waldo Emerson: An Estimate of his Character and Genius*, published November, 1882. (F. B. S.)

ALCOTT, LOUISA MAY, daughter of the preceding, was born on his birthday, Nov. 29, 1832, at Germantown (now in Philadelphia). She went with her family to Boston in 1834, where her education was begun by her father in his celebrated Temple School, but not until after it had been removed from the Masonic Temple, which suggested its name. The school dwindled in consequence of Mr. Alcott's unpopular opinions until, in 1839, when it was given up, there were but five pupils, three of whom were Miss Alcott and her two sisters, Anna (now Mrs. Pratt) and Elizabeth, and one was a colored boy, whom Mr. Alcott had retained in his class against the remonstrances of the wealthy parents of his other pupils. The Alcotts continued the education of their children at home, and after they went to live in Concord in 1840, Thoreau was for a time their teacher. In 1843, Miss Alcott, then ten years old, went with her parents and sisters to "Fruitlands," in Harvard, Mass., where they had the adventures described by her in *Transcendental Wild Oats*. Returning to Concord in 1844, she lived for some years in the hillside cottage which Nathaniel Hawthorne afterwards bought, and to which he gave the name of "The Wayside." At this period she was intimate with the children of R. W. Emerson, and composed for them and for her own sisters the stories which made up her first book, *Flower Fables* (Boston, 1855), and which were mostly written at the age of sixteen. At this age Miss Alcott returned to Boston, and soon began to write stories for the weekly newspapers, particularly the Boston *Evening Gazette*, in which her first tale appeared. She also wrote for the stage, and had serious thoughts of becoming an actress, for which she and her sisters had much talent, having cultivated themselves by practice in a domestic theatre at Concord. From sixteen to twenty-three she was a teacher or governess, writing in the intervals of her school-tasks; and she continued to teach now and then until her recognized success in authorship (1863–64) relieved her from the labor of teaching. In 1862, while living with her family at the Orchard House in Concord, she offered herself as a nurse in the army hospitals at Washington, and spent some months in that service, until she was prostrated by fever. After recovering from a long illness, which brought her very near death, she pieced together the letters she had written home from Washington into a lively and pathetic series of *Hospital Sketches*, which first appeared in the Boston *Commonwealth* in 1863, and, becoming popular, were published in the volume that first made her widely known as a writer. Other books followed—her first novel, *Moods* (Boston, 1864), which has since been rewritten and republished (Boston 1881), several little collections of tales and sketches, and finally, in 1868, the first of her popular books for children. *Little Women*. This was so successful that she soon published *An Old-Fashioned Girl*, (Boston, 1869), a continuation of *Little Women* (1870), and *Little Men* (Boston, 1871); then *Aunt Jo's Scrap Bag* (6 vols. 1872–82); a second novel, *Work* (1873); *Eight Cousins* (1875); *A Rose in Bloom* (1876); *Silver Pitchers* and *Independence* (1876); *Under the Lilacs* (1878); *Jack and Jill* (1880); *Proverb Stories* (1882); and some other books. A collected edition of her works was issued in Boston in 1881. Although her home is in Concord, with her father, she declares that she cannot write in that town, and that when she has a book in hand she betakes herself to Boston, where she lives in lodgings not far from the State House. It was in this neighborhood that she was living in 1854–55 when her first book was published, and she seems to regard it as favorable to her genius and to success in writing.

Miss Alcott is a fluent and forcible, rather than a correct or elegant, writer; possessing much humor, a keen eye for personal traits, a warm heart, and great knowledge of what really interests young persons, and particularly girls. She has not succeeded so well in her novels as in that type of fiction for the young which she may almost be said to have created, since her stories are unlike any that preceded them; but on her own ground she is unrivalled, and is now one of the most popular authors in America. She has wrought much of the romantic history of her own family into her books, and this has given them a certain biographical interest. Her plots are simple and natural, her dramatic power sufficient for the representation of character which she undertakes; and while her fictions may not be accepted as doing the same justice to New England that Miss Edgeworth did to Ireland, it is still true that they are peculiar to New England, and could hardly have been written elsewhere. Of late she has been withdrawing from fictitious writing, with some purpose of devoting herself to biography, but no work of this kind has yet come from her pen. (F. B. S.)

ALCOTT, MAY (MADAME NIERIKER), (1840–1879), a sister of the preceding, born in Concord, Mass., July 26, 1840; died in Paris, Dec., 1879. Before her marriage in 1878, May Alcott had distinguished herself as an artist, and had made designs for one of her sister's books, and published a volume of *Concord Sketches*, one or two of which have been reproduced by her father in illustration of his *Ralph Waldo Emerson* (Boston, 1882).

ALDRICH, THOMAS BAILEY, an American poet, was born at Portsmouth, N. H., in 1837. Intending to go to college, he began a preparatory course of study, but upon the death of his father removed to New York and entered the office of his uncle, a banker. Here he remained three years, and during this time contributed his first verses to the New York journals. In 1855 a volume of his poems was published under the title *The Bells*. This was followed by *Baby Bell*, a poem which secured a wide popularity. He then left his uncle's business to enter upon a literary career in New York, contributing to *Putnam's Magazine*, the *Knickerbocker*, and the weekly papers. In one of these first appeared *Daisy's Necklace, and What Came of It*, a prose poem afterwards published in book-form. In 1856 he joined the staff of the *Home Journal*, then edited by N. P. Willis, and remained in this connection for three years. In 1866, Mr. Aldrich became editor of *Every Saturday*, a journal then started in Boston, and continued in that position as long as the paper was published. In 1881 he succeeded Mr. W. D. Howells as editor of the *Atlantic Monthly*, but he still contributes occasionally to other magazines. Since 1855 he has published the following volumes: *The Ballad of Baby Bell, and Other Poems* (1856); *The Course of True Love never did Run Smooth* (1858); *Out of his Head, a Romance in Prose* (1862); two vols. of poems (1863, 1865); *The Story of a Bad Boy* (1869), which is considered somewhat autobiographical; *Marjorie Daw* (1873); *Prudence Palfrey* (1874); *Flower and Thorn* (1876), a collection of poems; *Tom Bailey's Adventures* (1877); *The Queen of Sheba* (1877); *The Story of a Cat*, translated from the French (1878); *Lyrics and Sonnets* (1880).

ALDRIDGE, IRA (1804–1867), a negro tragedian, called "the African Roscius." was born at Belair, near Baltimore, Md., in 1804. His father is said to have been a native chief from Senegal. In his youth Ira was apprenticed to a ship-carpenter, and from association with some Germans acquired their language. On

Edmund Kean's second visit to the United States in 1826, Aldridge became his valet, and accompanied him to England. His natural talent for the stage was evoked by association with the great actor, and it is said he returned to America in 1830 and appeared without success in Baltimore. He made his first appearance in London at Covent Garden, April 10, 1839, as Othello, and was afterwards engaged in leading parts in this and other theatres. His talents were appreciated, though naturally he was preferred in parts appropriate to his complexion. He played Othello, Shylock, Zanga, Orozembo, Zarambo, Rolla, and other characters. In 1852 he visited Germany, and for three years attracted large audiences. At Berlin the king sent Aldridge an autograph letter conferring upon him the first-class medal of arts and sciences and the title of chevalier. From the emperor of Austria and various German princes he received numerous decorations and honors. In Russia he met with special favor, nobles and peasants vieing to do him honor. A correspondent of *Le Nord*, writing from St. Petersburg Dec. 5, 1858, says: "From his appearance on the stage the African artist completely captivated his audience by his harmonious and resonant voice and by a style full of simplicity, nature, and dignity. For the first time we had seen a tragic hero talk and walk like common mortals, without declamations and without exaggerated gestures. . . . You feel the tears in his voice when he questions Iago, then the deep sobs which stifle it; and finally, when he is persuaded that his wretchedness is complete, a cry of rage, or rather a roar like that of a wild beast, starts from his abdomen. I still seem to hear that cry; it chilled us with fear and made every spectator shudder. Tears wet his cheeks, his mouth foamed, his eyes flashed fire. I have never seen an artist identify himself so perfectly with the character he represents." In 1866, Aldridge turned his steps to France, and in October appeared at Versailles. His success was flattering, and at a banquet given him by leading literary men Dumas *père* greeted the actor with a kiss. Aldridge acquired wealth, and lived in handsome style at Sydenham, near London. On his way to St. Petersburg to fill an engagement he was attacked with typhus fever, and died at Lodz, in Poland, Aug. 7, 1867.

Aldridge was full six feet in height, of fine proportions, with full beard, his features and hair decidedly negro. His head was large, measuring twenty-three and a half inches in circumference. He was twice married—first to an English lady, the comfort of his early years when struggling for recognition; afterwards to a Swedish baroness, who still survives. His success in Europe never caused him to lose interest in America, and it was his ambition to assert on his native soil the histrionic genius which all Europe had approved. Arrangements had been made for his appearance in New York in the autumn of 1867, but these were frustrated by his sudden death. (R. T. G.)

ALECSANDRI, Vassili (in French, **Alexandri, Basile**), a Roumanian poet, politician, and diplomatist, was born at Mircesti, in Moldavia, in 1821. He belongs to a patrician family originally from Venice, but settled in Moldavia for three centuries. He was educated at a French boarding-school in Jassy till the age of fourteen, when he was sent to Paris in charge of a tutor and in company with Alexander Couza, since prince of Roumania. After receiving his degree as bachelor in letters he studied for a time medicine, law, and science, and then travelled in Italy. Returning home in 1839, he was employed by the Government in the department of pensions, and in association with other young men of education endeavored to introduce the progressive ideas and literature of the West to his countrymen. For this purpose a review, called *La Dacie littéraire*, was founded by his friend M. Cogalnicean, and to it Alecsandri was a frequent contributor. His first work was a novel, *La Bouquetière de Florence*; in the *Glaneur* he published several French poems. In 1842, after the death of his mother, he spent months in traversing the Carpathian mountains and collecting the popular songs of his country. In 1844 he was entrusted with the direction of the theatres of Jassy, and composed several plays, which were highly successful, though the satiric tone of some of them drew on him threats of banishment from the reigning prince, Michael Stourza. These plays laid the foundation of the native Roumanian drama. Their scenes were taken from the life of the people, and their characters are types of a society already passing away. Inspired with the beauty of the popular poetry he had gathered, he endeavored to ally with it the culture introduced by Young Roumania. His poems, written in this spirit and modestly called *Essays*, first appeared in the journal called *Le Progrès*, and were at a later period published, with some others, in Paris under the title *Doïne si Lacrimiore*. After a brief existence of nine months, *Le Progrès*, founded by Alecsandri and his friends, was suppressed by the prince. The poems, however, had done their work, and given new life to Roumanian literature. The author now set out on a journey to the East, but returned to take part in a premature attempt at revolution in Jassy in March, 1848. Though banished from his native land in consequence, he did not depart till he had sent forth his celebrated poem, *Desteparea Romanier*, which has been called the Roumanian Marseillaise. During his exile at Paris he defended the interests of his country in the leading French journals. A second attempt at revolution was more successful: Michael Stourza was dethroned, and in 1850 Gregory Ghika came into power. As the latter promised to adopt a liberal policy, Alecsandri returned, and was employed by the Government in the department of archives. He also founded the review *Romania litterara* as the organ of salutary reform, and wrote several plays for Millo, an actor of remarkable talent. In 1853 he yielded again to his love of travel, and visited Spain and Morocco, in order to complete Oriental studies commenced long before. On his return he freed his slaves of Gypsy race, and his generous example was followed by nearly a thousand boyards before the emancipation ordered by Prince Ghika. During the Crimean War he visited Sebastopol, and while inspecting Fort Malakof after its capture was nearly killed by a shell thrown by the Russians. One of his finest poems is *Les Ruines de Sevastopol*. At this time began the movement for the union of Moldavia and Wallachia under the traditional name of Roumania. For this Alecsandri labored with his accustomed zeal, and his Song of the Union (*Hora Unizer*), struck off in 1856, became in a few days a national ode. In 1857 he was elected a member of the Divan *ad hoc* ordered by the Treaty of Paris, and was afterwards minister of foreign affairs in the provisional government of Moldavia. In 1859, after the union of the principalities under his friend, Prince Alexander Couza, Alecsandri was sent to France, England, and Italy to secure recognition of the new state. In this he was successful, and returned in 1860, bringing 10,000 muskets presented to the Roumanian army by the emperor Napoleon III., as well as several French officers to improve the military system. Amid the political confusion that followed Alecsandri retired to his ancestral estates on the banks of the Sereth, and has since devoted himself chiefly to literary pursuits. His fame was greatly enhanced by his legendary drama, *The Despot*. In 1877, inspired by the brave deeds of the Roumanian army beyond the Danube, he published a series of heroic poems, *Ostasi nostri*, the most characteristic of which has been translated into several languages, including English. In 1878 he was invited to compete at the floral games at Montpellier, and his *Chant de la Race latine*, which carried off the prize, has since been translated into most European languages. Throughout his career, literary as well as political, he has been distinguished by a truly national spirit, while his poetic genius, as well as skill in versification, secures him a high rank among contemporary writers. He is most widely known by his French translation of Roumanian poetry, *Ballades et Chants populaires de la Roumanie*, first published at Paris in 1855, with an introduction by A. Ubicini. His works, both French and Roumanian, issued at various times, have been collected into twelve volumes, published in Bucharest. They comprise dramas, comedies, poems, and a volume of prose.

ALECTORIDES (Gr. *ἀλέκτωρ*, a cock; *εἶδος*, resemblance), in ornithology, a group of birds very differently defined by various writers. Thus, formerly of uncertain standing, it has of late come to be used by the best systematists to designate a group consisting of the cranes (family *Gruidæ*), rails (*Rallidæ*), and their immediate allies, presenting the following combination of characters: Palate schizognathous; nasal bones schizorhinal or holorhinal; maxillo-palatines thin and laminate; angle of mandible truncated; normally no basipterygoid processes; carotids two; two cœca coli; no powder-down tracts; nature normally præcocial and ptilopædic. The limitation of the order is a matter of some difficulty, owing to the uncertain position of a few forms which may or may not belong here. One division of the order contains the cranes, another the rails. (E. C.)

ALECTOROMORPHÆ (Gr. *ἀλέκτωρ*, a cock; *μορφή*, form), in ornithology, a term invented by Huxley in 1867 to designate the *Gallinæ* of authors, exclusive of the *Columbæ* and *Tinamidæ*, as one of the major divisions of schizognathous carinate birds. The group thus framed contained the families *Turnicidæ*, *Phasianidæ*, *Pterocletidæ*, *Megapodiidæ*, and *Cracidæ*. It has since been restricted by the removal of the first and third of these. (E. C.)

ALECTOROPODES (Gr. *ἀλέκτωρ*, a cock; *πούς*, foot), a subdivision of the *Alectoromorphæ*, or *Gallinæ* proper, as distinguished from those *Gallinæ* which have the hind toe inserted low down, as in pigeons, and are therefore PERISTEROPODES (*q. v.*). The typical family of *Alectoropodes* is the *Phasianidæ*, or pheasants, embracing domestic fowls; the turkey, guinea-hen, grouse, and partridges are closely related. (E. C.)

ALEUTS, the inhabitants of the Aleutian Archipelago, a race of people resembling in physical characteristics the Esquimaux, but having, as it would appear, stronger linguistic affinities with certain Asiatic races than with the Innuit proper. The name is said to be from the Russian *aleut*, a high rock. The natives are called "Ungungun," or people, in their own language, but those of the eastern parts call themselves "men of the East." They are divided into two tribes, Oonalashkans and Atkhas, speaking different dialects. The Aleutian islands were first discovered by Russian voyagers in 1745, at which time the inhabitants numbered 10,000. The cruel treatment to which they were subjected reduced them, at one time, to little more than 1000. Tribute was levied upon them, and their treatment by the Russians was not less brutal than that of the southern Indians by the Spaniards.

The Aleuts have a mild, intelligent expression of face, and abundant lank hair. They wear ornaments in the nose and upper lip. Their shape is distorted from sitting so much in boats, but they are robust and active. The Fox Islanders dwell in immense underground holes, from 100 to 300 feet long and 20 or 30 wide. These holes are covered with poles and earth, are partitioned inside, and have several entrances. Some of them are large enough to contain 300 inhabitants. A boat bottom upward forms their summer-house. Their principal food consists of raw seal and otter, whale and seal blubber, fish, etc. Their weapons are barbed darts, lances, spears, harpoons, and arrows. They also carry a sharp stone knife 10 or 12 inches long. For defence they wear a dress of plaited meshes and a cap with an enormous front brim to protect their faces from the sun. They were once almost constantly at war, a system of blood-atonement for offences keeping up incessant feuds.

The household utensils of the Aleuts consist of implements of stone, wood, and bone, of mats and baskets neatly woven of grass and tree-roots, bone needles, thread and cord of sinews, etc. They are very hospitable, and fond of dancing and of pantomimic performances, are quiet in demeanor and seemingly gentle, though brutal when aroused by passion. They can endure great fatigue, heat, cold, and hunger. Formerly, no marriage ceremony was used. Each man took as many wives as he wished, and sent them back when tired of them. The dead were clothed and masked, and placed in a rock-cleft or swung in a boat or cradle from a pole in the open air.

Regarding the former religious opinions of the Aleuts little is known. The Russian priests have had great success in gaining proselytes, and many of the old traditions and beliefs are lost, for the people may now be regarded as Christianized. They formerly believed in a creative God, whom, however, they did not worship. Their worship was given to the spirits of the earth, to the stars, the sun, and the moon. They had no idols, and little reverence for the priests, and their religion was probably, like that of many of the northern tribes, little more than a vaguely-entertained set of superstitious observances. In 1880 they numbered only 2175, and this number has since been greatly reduced by a pestilence. (C. M.)

ALEWIFE, the common term along the New England coast for two species of Clupeids of the genus or sub-genus *Meletta*—the *M. vernalis* and *M. æstivalis* of Mitchill. Both agree in the rather high body, short head, emarginate upper jaw, and scarcely projecting lower jaw, as well as the development in the old of teeth only on the tongue; one (*M. vernalis*), however, has relatively large eyes, lower fins, and the peritoneal lining of the abdominal cavity pale; while the other (*M. æstivalis*) has smaller eyes, higher fins, and the peritoneum blackish. The former is the more abundant, begins to run up the streams earlier, and may be looked upon as the typical alewife; the latter is discriminated by some of the fishermen in the North as the "blue-back," and in the Chesapeake Bay as the "glut herring;" the *M. vernalis* being contradistinguished as the "branch herring." Still other names are applied to the alewives along different parts of the coast and the adjacent river-courses—*e. g.*, gaspereau (in the British provinces) and spring herring; and they are especially known as herring in Maryland and Virginia, but are not to be confounded with the true sea-herring, or *Clupea harengus*.

In the opinion of the U. S. commissioner for fish and fisheries (Prof. Baird), the alewife "in many respects is superior, in commercial and economical value, to the herring, being a much larger and sweeter fish, and more like the true shad in this respect" (*U. S. Fish Com. Rep.*, ii. lix.). It is not only useful as an article of food for man, but as provision for other fishes in fresh water, such as the Salmonids and black bass, while it does not interfere with the latter, feeding on minute crustaceans and other organisms which are neglected by the carnivorous species. Even the productiveness and thrift of a number of sea-fisheries is supposed to be dependent on the alewife to some extent. Baird, "after a careful consideration of the subject," is strongly inclined to believe that the diminished numbers of cod, haddock, and hake, among other species, "is due to the diminution, and in many instances to the extermination, of the alewives;" adding that "we know that the alewife is particularly attractive to other fishes, especially to cod and mackerel."

The alewife, unlike the true herring, but like the shad, is an "anadromous" fish, ascending streams and running far up into the fresh water in the spring to spawn. The young leave the fresh water for the salt as soon as they are able to make the journey, and do not return till grown and ready themselves for the labor of propagation. The period of growth seems to be about four years, although there is a difference of opinion among fishermen respecting this point, some fixing the first return from the sea "at two, and others at three or more, years."

Formerly, the alewife was excessively abundant, but constant and indiscriminate fishing, damming of rivers, etc., have much reduced its numbers, although it still compares favorably with other species. But its economical importance is such that it has been deemed desirable to arrest its further decrease and to restore it as much as possible to its former abundance.

The artificial propagation of the alewife has been effected, and can be carried on with little difficulty, both by transplantation of the fish and planting of the fertilized eggs. In the words of Milner, it has "in numerous instances been largely multiplied by carrying the parent-fish above the dams that prevent access to their favorite spawning-grounds, or even to new waters. According to Gen. Lincoln, an experiment of this kind was made successfully as long ago as 1750. This has been a common practice in the shorter rivers on the Massachusetts coast, generally with good results" (*U. S. Fish Com. Rep.*, ii., 527). F. M. Wallem, in a special report on American fisheries, remarks that "many experiments have been made also which have testified how easy the alewife is to hatch out, how quickly it grows to an edible size (three years), and how rapidly it multiplies. It is estimated that every shad with spawn has 50,000 to 80,000 eggs, and that the fresh-water herring, or alewife, has, in proportion to its size, four times as many eggs" (translated in *U. S. Fish Com. Report*, vi., 105). Baird has epitomized the results of experiments made in the statement that "of all American fish, none are so easily propagated as the alewife." (T. G.)

ALEXANDER II. Nikolaiévitch (1818–1881), emperor of Russia, was the eldest son of the emperor Nicholas I., and was born on the 17th (29th) of April, 1818, while his uncle, Alexander I. Pavlovitch, was still on the throne. It was generally supposed that the succession would fall to Constantine Pavlovitch, the brother next in age, and the first seven years of the young Alexander's life were happily spent free from the shadow of the coming crown. In Dec., 1825, Nicholas Pavlovitch was suddenly called to the throne, and his first official act was the crushing of the Dekabrist (or December) conspiracy, which had taken advantage of the three weeks' interregnum to undermine the imperial power. The rule of the "crowned sergeant" pressed heavily on all the Russians, but no one suffered more from it than the liberal-minded tsarévitch. His mother, Alexandra Feodorovna, *née* the princess Charlotte, daughter of Friedrich Wilhelm II. of Prussia, sympathized with him, and cultivated the sympathetic and feminine side of his nature. One of his tutors was the poet Zhukovski, who taught him the ancient languages and was the first to implant in his mind the idea of emancipation. But his father, who was a genuine military martinet, subjected him to the sternest discipline of a soldier, although he much preferred the arts of peace and took far more pleasure in the society of ladies than in studying the science of government or practical arms.

When sixteen, Alexander came of age, and on the 4th of May, 1834, took the oath of succession in the chapel of the Winter Palace. He was appointed first adjutant to his father, hetman of the Cossacks, commandant of the guard of lancers, and chancellor of the University of Finland. In 1838 he travelled in Germany with Count Orlof, and at the court of Hesse-Darmstadt he chose for his wife the accomplished Wilhelmine Maximiliane Marie, daughter of the grand duke Louis II. He was married in 1841, the princess assuming the Greek religion and the name of Maria Alexandrovna. In 1850 he travelled through Russia, and extended his tour to the Caucasus, where he took part in the war against the Lesghian leader Shamyl, and won a victory for which he was rewarded with the decoration of the George order.

On the death of Nicholas I. (March 2–14, 1855) Alexander II. mounted the throne amid the thunders of the Crimean War. Nicholas had seen that it was a forlorn hope. Just before his death he told his son that he had done his best to leave the empire steadfast and at peace. "But you see," he said, "at what a time and under what circumstances I am dying. God has willed it so. You will find the burden hard to bear." For the sake of appearances, Alexander II. issued a manifesto in which he called upon God to assist him in keeping Russia at the highest point of power and glory and in accomplishing the designs and wishes of his "illustrious ancestors, Peter the Great, Catherine, Alexander the Blest, and his father of imperishable memory." In spite of the warlike sound of the manifesto, Russian securities immediately advanced in the stock exchanges of Europe. After the destruction of Sevastopol (Jan., 1856), Alexander II. promised the nobles of Moscow to continue the war for the sake of glory, and called upon the people to sacrifice their last drop of life-blood to preserve the integrity of the empire. Nevertheless, the successful summer campaign in Georgia and Turkish Armenia and the capture of Kars by Gen. Muravief (Nov. 28, 1855) were hailed as a sufficient offset to the loss of the Crimean citadel; so that the appeal of Napoleon III. in his *rôle* of angel of peace was gladly heard. Russia had lost 250,000 men, an irredeemable paper currency had driven out the precious metals, the banks paid only in paper, the national credit was almost exhausted, agriculture had been neglected, and the country was on the verge of ruin. On Jan. 16, 1856, the emperor yielded, and the Peace Congress met in Paris. The articles were signed on the 30th of March, and Russia was left to recuperate from its terrible losses. Alexander II. was crowned on the 7th of September, and in the manifesto which appeared on the same day he made provision for many long-needed reforms, especially those in regard to military service and the taxes. A new census and a four years' exemption from the conscription were promised. Many political criminals were pardoned, and debts of private persons in arrears to the state, aggregating 24,000,000 rubles, were remitted. Alexander II. also accomplished other good works. He allowed foreign ships to enter Russian ports without restriction; he repealed the law limiting to 300 the students in the universities; he reduced the excessive fees for passports; he put an end to the disgraceful military schools. The rigor of the censorship was modified; freedom of speech was granted in large measure; and criticisms of the Government, which in the reign of Nicholas were scarcely confessed even in secret, were not only made openly, but there even appeared a disposition to profit by them. A witty Russian is reported to have said that had Nicholas forbidden his subjects to appear on the streets, and Alexander repealed that law, he would have been considered by the emancipated as the most liberal monarch of his day.

The great question which more than any other demanded settlement was the liberation of the serfs. For fifty years serfdom had been recognized as the chief danger of the state. Alexander I. had taken the matter into consideration, but nothing had come of it. Nicholas also had in 1838 appointed a committee, under Count Bludof, to report on the state of the serfs, but, owing to bad harvests in the following year, the matter was postponed. Thus it became one of the hard burdens which fell to the lot of Alexander II.

In 1861 the serf population of Russia amounted to 45,862,086 individuals, of whom 23,300,000 were so-called crown-peasants; 936,477 appanage peasants, belonging to churches, schools, hospitals, mines, and factories; 1,467,378 *dvorovuie*, or domestic servants; and 20,158,231 peasants, attached to the soil and belonging to private proprietors. The first step was taken by granting the crown-peasants their personal liberty; this was done in June, 1858. Almost immediately after the Treaty of Paris was signed, Alexander II. invited his "faithful nobles" to help him change the existing manner of holding serfs. Many of the nobles were willing to exchange their rights for a parliamentary share in the government. Committees were called together, and forty-six of them, composed of 1336 proprietors, voted to abolish serfdom, but to give no land to the liberated serfs. Such a policy was evidently fatal, for it was a proverb among the serfs that though their bodies belonged to the proprietors, they owned the land. The emperor, by the wise advice of his first mistress, the liberal princess Dolgoruka, interfered, and appointed the "imperial commission" which prepared the famous ukase of Feb. 19–March 3, 1861, by which the peasant was allowed to borrow money of the state and buy of his master the land which his ancestors had cultivated. In order that all the requirements might be carried out fairly, a number of commissioners, with the title "justices of the peace" (*mirovoi sudii*), were appointed, and it was said that as a general thing their judgments gave thorough satisfaction.

The emancipation of the serfs has been disappointing in its results; delivered from the tyranny or care of private masters, the unhappy peasants have fallen under a harder bondage—that of the *mir*, or village commune. It is now recognized that the radical error which rendered almost nugatory the hopes of the imperial deliverer was in preserving the communal system of holding the land. When emancipation was about to become a fact, the Slavophile party, under the lead of Mikhail Katkof, editor of the *Moscow Gazette*, insisted that the *mir*, which was a national institution, offered a ready solution to the difficulties which perplexed the other countries of Europe. Instead, therefore, of giving to each "soul" or male peasant a portion of land to be held in severalty, the land was vested in the village commune, and each head of a family received by lot his portion to be cultivated for a limited time. Although this system of land-tenure did away with the danger of a proletariat, its effect upon individuals has been disastrous. Men capable of working have felt their ambition crushed by the fact that no reward would be forthcoming, and that the laziest vodka-drinker in the community would reap an equal share of the profits. Moreover, the village usurers, generally if not always Jews, have taken advantage of the peasants' necessities, as too often happens in impoverished agricultural communities.

By a series of edicts preceding and following that of emancipation, other reforms were instituted. A new judicial system, including trial by jury, was introduced; corporal punishment was abolished in the army; the censorship of the press was made far less rigorous.

The accession of Alexander II. raised great hopes in Poland. Some of the patriotic party even looked for a renewal of the constitution and the reunion of Lithuania with the kingdom. But all such hopes were doomed to disappointment. In 1863 an insurrection broke out in Warsaw and rapidly permeated the whole province. At first the Russian liberals were inclined to sympathize with Poland, but the *Moscow Gazette* declared that it was the duty of the state to crush all rebels—that if Panslavism was to accomplish anything, Russia must preserve its unity. Katkof's influence was very great, and a reaction set in. Alexander II. appointed the brutal general Muravief commander of the troops in Poland. The insurrection was crushed with extreme cruelty; the leaders were shot or hanged; villages and towns were sacked and burned; the estates of the disaffected nobles were confiscated. In the end, the Polish nationality was almost rooted out; the Russian language replaced the Polish in all schools; Russians filled the public offices; and the Roman Catholic churches were closed throughout the land. In 1866, Poland was divided into ten provinces.

The Polish troubles were naturally accompanied by agitations in Russia. The younger men especially saw whither things were tending. Kovalevski, the liberal minister of education, was replaced by the narrow-minded Count Putiatin, whose arbitrary measures soon caused a ferment among the students at the larger universities; that at Moscow in the autumn of 1863 ended in bloodshed. On the 4th of April, 1866, Vladimir Karakozof, a member of a revolutionary society, shot at the emperor as he was walking in the Summer Garden, but missed his aim. This attempt was followed by many others. In the latter years of the emperor's life he was at no moment safe. Proofs of this were constantly cropping out. Berezovski aimed at him in Paris in 1867; the same year he made a short journey to Riga, and extraordinary precautions were taken to protect his life. In 1878, Viera Sasulich murdered Gen. Trepof, mayor of St. Petersburg, and was acquitted; Gen. Mezenzof, chief of the "Third Section," was killed; the lives of Col. von Keyking and the police chiefs of Kief were attempted. In 1879 occurred student-riots in Moscow and St. Petersburg, the closing of the medical schools, the suit against Bramof and his friends, the death of Prince Krapotkin, governor of Kharkof, the so-called "trial of the fifty-three," the attempt on Gen. Drentelen (March 25), the attempt on the emperor's life by Solovief (April 14), the Nihilistic boycotting of the merchants Karkoref and others, and the attempt to wreck the railway-train on which the emperor was going to Moscow (Dec. 1). In Feb., 1880, a terrible explosion occurred in the Winter Palace. The excitement was still further increased by Gen. Gurko's orders for every householder in St. Petersburg to keep a watchman night and day at his door to prevent the posting of seditious placards and the spread of revolutionary literature. All the large cities were declared to be in a state of siege, and the police were ordered to expel all suspicious individuals. On the 18th of August, 1880, Alexander II. suddenly dissolved the so-called "Third Section," or secret police, and called the liberal Armenian, Gen. Loris Melikof, to be governor of St. Petersburg, with the power of a military dictator. Melikof refused to grant a constitution, but his wise measures caused a momentary lull in the activity of the Nihilists. The hope of permanent change was doomed to disappointment. Soon the old symptoms revived with increased energy, and at last, on the 13th of March, 1881, as the emperor was driving through the streets of St. Petersburg, he was killed by an Orsini bomb.

It has been said that the history of the last ten years of the reign of Alexander II. is the history of a failing belief in autocracy. Externally, it was in many respects a period of growth. The territory was vastly increased in Asia. No less than 30,000,000 subjects were added; the army was raised from less than 1,000,000 to 2,125,000; the state income was more than doubled; the number of students at the universities gained 50 per cent., that of the higher schools was doubled, and that of the common schools was increased fivefold; the mileage of railroads was raised from 700 kilometres to more than 22,000; the constitution of Finland was renewed; the freedom of confession was restored to the Baltic provinces; the Caucasian war was brought to a successful termination; and although the Turko-Russian war of 1877 was not productive of results proportionate to its enormous cost of money and men, yet Russia had the satisfaction of knowing that the mortifying Black Sea article had become a dead letter, and that the Danubian provinces were removed from the destructive rule of the Ottoman Porte. (N. H. D.)

ALEXANDER III., ALEKSANDROVITCH, emperor of all the Russias, is the second son of Alexander II. and the princess Maria of Hesse-Darmstadt. He was born March 10 (Feb. 26), 1845. He received a regular university education and was trained in military affairs. At the death of his elder brother, Nicholas, at Nice, in 1865, Alexander became tsesarévitch, and Nov. 9, 1866, he married his brother's *fiancée*, Maria Sophia Frederika Dagmar, daughter of King Christian of Denmark. In accordance with the Russian custom, she took the new name of Maria Feodorovna. During the Turko-Russian war the tsesarévitch was in subordinate command, and operated against the Turkish positions at Rustchuk, Rasgrad, and Shumla. After the loss of Plevna his troops were kept inactive until August and September, 1877, when only the masterly blundering of the Turkish generals, Mehemet Ali and Fua Fuad Pasha, prevented them from being totally defeated.

Alexander II. was assassinated on the 13th of March (N. S.), 1881, and on the following day his eldest son was proclaimed emperor of all the Russias. Alexander III. was now 36 years of age, and a worthy scion of the house of Romanof-Holstein-Gottorp. It was said of him that he had his grandfather's energy and his father's humanity, while his private life has been unsullied by the scandals which made the example of the former unenviable.

The executive committee of the Nihilists immediately after Alexander's accession published a proclamation justifying their action in "executing the tyrant," and warning the newly-crowned Alexander III. that he must be just. *The Will of the People* demanded a complete amnesty, the election of a popular legislative assembly by universal suffrage, and a constitution. It was threatened that if the assassins of the late tsar were put to death further acts of vengeance would follow. Alexander III. was not disturbed by threats. He determined on a reactionary course. The assassins were tried, found guilty, and executed. His father's conservative ministers, with whom in early life, while under the influence of the liberal Aksakof, he had quarrelled, were retained. Count Shuvalof was entrusted with an important foreign mission; Melikof was superseded by Count Ignatief, and was banished from Russia. At first, there was some semblance of the Western cabinet of responsible ministers. This cabinet contained a triumvirate which represented liberal ideas—Gen. Melikof, minister of the interior; Gen. Miliutin, minister of war; and Count Abaza, minister of finance. Opposed to these relics of the reign of Alexander II. were the conservative ministers appointed by the new emperor—Gen. Ignatief, minister of domains, and especially the procurator of the Holy Synod, Pobedonovtsef, who had been the emperor's tutor. In April, 1881, Alexander III. published a manifesto announcing his policy. In reality, it had been prepared secretly by Pobedonovtsef and Mikhail Katkof, with the aid of the grand duke Vladimir, the emperor's brother. The publication of this manifesto was a great surprise to the other ministers, and they immediately offered their resignations under the plea of bad health.

Alexander III. knew perfectly well that many abuses needed correction. Corruption was rampant. During the last ten years of his father's reign more than half a million *desiatins* (58,000 hectares) of land in the richest provinces of Poland, the Caucasus, and the Urals were wrongfully wrested away from the public domain by the Russian functionaries and their creatures. Alexander II. himself had put out at interest in foreign countries large sums of money collected from the theatre, for the benefit of the beautiful princess Dolgoruka, his morganatic wife. Alexander III. appointed committees to examine into these matters, and in the autumn of 1881 many high officials received their dismission. Among them was Privy-Councillor A. P. Valuief, who, since Aug., 1872, had been minister of public domains. The same year Alexander investigated the condition of the police service. Gen. Baranof, prefect of police in St. Petersburg, reported that a large number of the agents were unable to write their own names, and that many commissioners were ignorant of the laws which it was their duty to enforce. Nevertheless, the police under Alexander III. is just as much a secret and all-powerful inquisition as when it bore the hated name of "the Third Section." The press is still gagged by a rigorous censorship, and any paper that dares to advocate ideas unfavorable to the administration is sure to be suspended or forbidden public sale. Pressure has been brought to bear upon Switzerland, the refuge of Nihilistic directories, "to limit its objectionable hospitality" and forbid revolutionary demonstrations. Yet, in spite of this reactionary tendency of the present emperor, it has been said by one of the severest critics of Russian affairs that Alexander III. seems more likely than any of his predecessors to succeed in delivering the empire from the hideous cancer which is devouring it. His private virtues, his unfailing courage, his noble aspirations, his freedom from unworthy favorites of either sex, his scrupulous honesty, and his high sense of the sacredness of his mission, are the happy auguries which accompany his reign. But, asks the critic, "How long will he escape the bombs and mines of the Nihilists? and what can one man do, however resolute and stern, in a country of more than 20,000,000 square kilometres?" (N. H. D.)

ALEXANDER, STEPHEN, LL.D. (1806–1883), an astronomer, was born at Schenectady, N. Y., Sept. 1, 1806. He was educated at Union College in that town, and for five years taught in a high school in Central New York. In 1831 he went to Georgia at his own expense to observe the total eclipse of the sun, and made his observations at Sister's Ferry. In 1832 he went to Princeton Theological Seminary, but in the next year was made tutor in the College of New Jersey, and soon after adjunct professor of mathematics. In 1840 he became professor of astronomy, in 1845 of mathematics, and in 1854 of mechanics and astronomy, which position he resigned in 1877 after forty-four years' active connection with the college. He was then made professor emeritus. He died at Princeton, N. J., June 24, 1883. He contributed to scientific periodicals several valuable papers, among which are "The Fundamental Principles of Mathematics" in *Silliman's Journal*, series ii., vol. 7; "A Philosophical Confession of Faith" (*Princeton Review*, 1867); "Origin of the Forms and Present Condition of the Clusters of Stars" (*Gould's Astronomical Journal*, 1852); "Law of Extreme Planetary Distances" (*Astronomische Nachrichten*, 1877); "On Certain Harmonies of the Solar System" (*Smithsonian Contributions*, 1875).

ALEXANDER, WILLIAM, D. D., bishop of Derry and Raphoe, was born at Londonderry, Ireland, in April, 1824. He received his education at Tunbridge School and at Exeter and Brasenose Colleges, Oxford. Entering holy orders, he first served as curate in the north of Ireland, and was preferred to one or two livings in the gift of the bishop of Derry. Afterwards he became rector of Camus-juxta-Morne, in Tyrone co., and chaplain to the marquis of Abercorn, lord lieutenant of Ireland. In 1864 he became dean of Emly. In 1867 he received the appointment of bishop of Derry and Raphoe, and was consecrated in St. Columb's cathedral Londonderry, Oct. 13, 1867. Shortly afterwards the degree of D. D. was conferred upon him by Oxford University. He has been an active writer. In 1850 he gained the university prize at Oxford for a theological essay, and in 1860 for a poem on a sacred subject. His chief works are *Leading Ideas of the Gospels* and *The Witness of the Psalms to Christ and Christianity* (1877). Among his other publications are a volume of poems, several lectures and sermons, papers on the Irish Church, etc., together with frequent contributions in prose and verse to periodical literature. He is married to Miss Cecil Frances Humphreys, well known as the author of *Moral Songs*, *Hymns for Children*, and *Poems on Old-Testament Subjects*.

ALEXANDRIA, the county-seat of Rapides parish, La., is on the south bank of the Red River, 198 miles N. W. of New Orleans. It has three railroads—the Morgan Louisiana and Texas, the New Orleans, Texas, and Pacific, and the Natchez, Red River, and Texas. Other railroads to pass through this city are projected. It has a court-house, town-hall, market-house, three hotels, three weekly newspapers, five churches, five schools, and is the seat of Louisiana Agricultural and Mechanical College. The latter has taken the place of the University of Louisiana, whose building was destroyed by fire in 1869. It has a foundry, saw-mills, and planing-mills. It was settled before 1800, and incorporated as a city in 1830. It was occupied by the Union army under Gen. N. P. Banks in 1864, and when he retreated was almost entirely destroyed by fire. It is now rebuilt, and has a neat appearance. Its property is valued at $500,000; its yearly expenses are $8000, and it is free of debt. Population, about four-fifths white, 1800.

ALGER, William Rounseville, Unitarian clergyman, lecturer, and author, was born in Freetown, Mass., Dec. 30, 1823. He graduated in Harvard University Theological School in 1848; preached first in Roxbury, then in Boston until 1873, lecturing extensively and writing much in reviews. He is author of the following works: *Introduction to the Poetry of the Orient; Metrical Specimens of the Thought, Sentiment, and Fancy of the East; Legislative Prayers; The Genius of Solitude; The Friendships of Women; Critical History of the Doctrine of a Future Life; The School of Life.* These works have passed through many editions and won much favor.

ALGERIA. We take up the condition, progress, and history of this colony from the beginning of 1872. From Aug., 1871, to March, 1873, the governor-general, under the civil government, was Vice-admiral J. de Gueydon. At the latter date he was succeeded by Gen. Antoine E. A. Chanzy, who had previously served in the army in Algeria from 1839 to 1870. Gen. Chanzy's administration continued for six years; in April, 1879, M. Albert Grévy, brother of Pres. Grévy, assumed the government of the colony, and in Nov., 1881, he was succeeded by M. Louis Tirman, formerly prefect of the Bouches du Rhône.

See Vol. I. p. 496 Am. ed. (p. 562 Edin. ed.).

The governors-general are invested with legislative as well as executive power in civil affairs, but in all important cases are required to take advice from a colonial council appointed by the French Government. The cost of the colony to France has always been materially beyond its revenues. These revenues are derived chiefly from indirect taxes, licenses, and customs duties on imports. The cost of the maintenance of the army, the expenditure for public works, and other large sums disbursed by the Government are not included in the colonial statements of expenditure, but are provided for in the French budget. The revenues of the colony have increased from 250,059 francs = $50,012 in 1830, to 52,386,955 francs = $10,477,391 in 1875, and 60,000,000 francs = $12,000,000 in 1880; and yet these sums were always less than the colonial expenditure, which in 1875 amounted to 57,110,872 francs = $11,422,174, and in 1880 exceeded 65,000,000 francs = $13,000,000. These expenditures were supplemented from the French budget by 24,496,109 francs = $4,899,222 in 1873; by 25,111,472 francs = $5,022,294 in 1877; by 27,483,860 francs = $5,496,772 in 1880; and by 29,974,599 francs = $5,994,919 in 1882. There is, however, an Algerian revenue collected in France, which may be set off against three-fourths or more of this expenditure.

The French troops in Algeria constitute one *corps d'armée*, of about 60,000 men. They are of two classes—the French troops proper, from 25,000 to 30,000 men, who remain there, in garrison, for a certain number of years, and then return to France; and the so-called native troops, who never quit the country, except on extraordinary occasions, such as the war against Germany in 1870–71, and who consist of twelve regiments of about 3000 men each, known as zouaves, Turcos, chasseurs d'Afrique, and spahis. Not more than one-half of these are really natives of Algeria, the remainder being European outlaws of all nations. They are said to be brave and fierce fighters, but have a terrible reputation for brutality and depravity.

The maintenance of this colony, at such a heavy expenditure on the part of France, was advocated by the Government before the Franco-German War, on the plea that it furnished an admirable training-school for French officers and soldiers; but that plea was exploded when it was found that the officers and men trained in Algeria were no match for the German soldiers trained at home. It does, however, furnish an outlet for the surplus agricultural population of France.

There has been a very gratifying increase of the productions of Algeria within the past ten years. The demand in France and Great Britain for "esparto grass" as an excellent fibre for paper-making has been steadily increasing, and Great Britain alone takes over $2,100,000 in value of it annually from Algeria, while France probably receives still more. The other exports are barley, wheat, dourra, flaxseed, dates, vegetable hair, cork, wood, etc., and iron, zinc, quicksilver, copper and lead ores, marbles of great variety and beauty, Algerian onyx, and raw hides and skins. The imports consist of cotton fabrics, coals, petroleum, provisions of all kinds, Indian corn, canned meats and fruits, India-rubber goods, hardware, agricultural implements, and shipping stores.

The following table shows the imports and exports from 1872 to 1880:

Years.	Total imports.	Total exports.
1872..................	$39,406,255	$32,815,615
1873..................	41,343,425	30,441,280
1874..................	39,260,865	29,881,400
1875..................	38,482,810	28,781,585
1876..................	46,177,320	35,762,320
1877..................	40,560,660	34,401,255
1878........................	46,361,150	31,960,840
1879........................	54,425,220	35,405,000

Of these imports, $712,472 were American products (part of them through French ports) in 1879, and $461,000 direct imports in 1881. The exports to the United States were $425,776 in 1879, and $326,000 in 1881. In 1880, Algeria exported to Great Britain $3,707,265, and imported thence $1,460,435. The greater part of her commerce (about two-thirds) is with France, and many articles, the production of other countries, are sent to her through French commercial houses.

In Jan., 1881, there were 1153 kilometres, or 714 English miles, of railway open for traffic in Algeria, and several other railways in course of construction. In 1879 there were 5580 miles of telegraph-lines and 9860 miles of wire in use in the colony.

History.—During the Franco-German War, when not only the French troops, but the so-called native troops, were called to the aid of France, Algeria was in an exceedingly unsettled state. The Kabyles, as well as the Arabs, made many raids upon the towns and settlements of the colonists. This condition of affairs continued till 1873 or 1874, and the French Government seemed almost powerless to prevent it. Industry was partially paralyzed, and immigration ceased. Under the wise and efficient administration of Gen. Chanzy (1873–79) order was gradually restored and production was increased. The year 1876 was the most prosperous one in the history of the colony, and the years which followed gave evidence of permanent improvement. In 1881 there was some trouble between the French Government and Tunis, growing out of the protection and shelter given by the bey of Tunis to Algerian insurgents, Kabyles and Arabs, who had ravaged a part of the Algerian territory, and, being defeated, had fled to Tunis for refuge. This trouble became so serious that the French landed an army in Tunis early in 1881, professedly to aid the bey in arresting these insurgents, but, as he still gave them aid and shelter, the forces were turned against him, and by the treaty of May 12, 1881, he was compelled to relinquish a portion of his territory and acknowledge himself a vassal of France. This conflict with Tunis greatly excited the native population of Algeria, who, as Mohammedans and of kindred races with the Tunisians, heartily sympathized with them, and frequent *émeutes* and insurrections have ensued, in which some of the colonists have been slain. The insurrection of Arabi Pasha in Egypt in the summer of 1882, though so summarily suppressed by British troops, increased the excitement of the Mohammedan tribes in Algeria, and an effort made by them to send a considerable force to Egypt, to aid Arabi Pasha, was only suppressed by the French troops with great difficulty. It is evident that these tribes can only be controlled by the exercise of great vigilance.

The territorial extent of Algeria is not well defined. It was increased in 1880, and again in 1881, and probably now exceeds 1,000,000 square kilometres, or more than 400,000 square miles. In 1877 the population, exclusive of the nomadic Arab tribes, was reported as 2,867,626. Later reports (of 1880 and 1881) give a considerably smaller population. The total population of European descent in 1877 was said to be 302,576, of which 127,321 were French. In 1880 the number of French settlers was said to have increased to 198,092, but the European total was not given. (L. P. B.)

ALGIERS, a suburb of New Orleans, La., was once a sugar-plantation. It was laid out as a village in 1815, but attracted no settlers until 1846, when the dry-docks were built here. It was incorporated as a city in 1852, and grew rapidly until the commencement of the Civil War. It suffered greatly during the war, but is now recovering. In 1870 it was made the fifteenth ward of the city of New Orleans, but retains its distinctive character. It has four dry-docks, one steam marineway, the Morgan Railroad shops, a cottonseed oil-mill, three steam fire-engines, one weekly newspaper, two public schools, and four churches. It is connected with the city proper by steam ferry-boats, and has a street railway. Population, 8855.

ALGONKIN INDIANS, the title given to a numerous and powerful family of American Indians united by community of language and by similarity of habits. The name of the family is taken from that of a tribe on the Ottawa River. It is said to be corrupted from *Adirondack*, or "Leaf-eaters." a derisive title applied by the Iroquois to a neighboring tribe. The principal Algonkin tribes are the Crees, Chippewas or Ojibways, Ottawas, Montagnais, and Nasquapees, of the North; the Micmacs, Abenakis, Pequods, Narragansetts, Mohegans, Adirondacks, Manhattans, Delawares, and Nanticokes, of the East; the Powhatans, Accomacs, Panticoes, and Shawnees, of the South; the Illinois, Pottawatomies, Sacs and Foxes, Cheyennes, Arapahoes, and Blackfeet, of the West. These tribes formerly inhabited an immense region, embracing all of British America south of the Churchill and east of the Lake Winnipeg region; running east of Hudson Bay into Labrador, where they bordered the Esquimaux; extending along the Atlantic coast to Cape Hatteras; thence by an irregular line to the mouth of the Ohio. On the west they were mostly bounded by the Mississippi and Red rivers, though some tribes extended farther west. All this immense space, with the exception of the regions inhabited by the Iroquois, the Wyandots, and the Winnebagoes, was occupied by Algonkin tribes.

In addition to their linguistic connection, the Algonkins were marked by similarities of character and habits. They disdained the culture of the soil, and lived a nomadic life in the dense woods of their territory, having no settled abode, subsisting on game, fish, fruits, and roots, and constantly engaged in war, which they pursued with fierce courage, torturing their prisoners with savage cruelty.

In form they are, as a rule, of moderate stature, but well-proportioned and very active. They are fond of decorating their persons with paint and other ornaments, generally extract their beards, and often seek to pluck all the hairs from the body. Their weapons originally consisted of the bow and flint-pointed arrows, of stone hatchets, and of knives of bone. They manufactured a coarse pottery. All labor was left to the women, who cultivated the ground to a slight extent. Their religious ideas were very crude, consisting in vague conceptions of a Great Spirit and of a future life without punishment of the wicked. They were completely democratic in organization and communal in possession of their territory. Their leaders had no political power, there was no trace of a public jurisdiction, and punishments for offences were left to the relatives of the injured person. At the beginning of the seventeenth century the Algonkins numbered more than 250,000; they are now reduced to about 40,000 persons.

The Algonkin languages are distinguished by harsh combinations of consonants, particularly in the Abenaki dialects. They differ in certain principles of grammatical formation from the other families of American speech. Several of the Algonkin dialects have been studied and reduced to grammatical rules. Among the works relating to this subject may be mentioned Eliot's Indian Bible, Zeisberger's *Spelling-book and Grammar of the Delaware Tongue*, Duponceau's *Memoir on the Grammatical System of some North American Languages*, and the works of Rale, De Boulanger, and others. (C. M.)

See Vol. I. p. 505 Am. ed. (p. 574 Edin. ed.).

ALIBI (Latin for "elsewhere"), signifies, in criminal law, a method of disproving the prisoner's participation in the crime for which he is tried by the production of affirmative proof that at the time of the commission of the crime he was present at some other place than that at which the crime was perpetrated (*se eadem die fuisse alibi*). It is a not infrequent defence in criminal cases, and is often a very valuable one to innocent parties. The ease with which evidence to support it can be manufactured causes it to be looked upon rather suspiciously, and it has been laid down—contrary to the general rule, which says that the burden of proof never shifts in criminal cases, and that the prosecution must make out beyond a reasonable doubt all points necessary to a conviction —that the defendant who relies upon proof of an alibi must establish his defence by a preponderance of testimony. The better rule, however, would seem to be that after all the evidence, including that offered to support an alibi, has been given in, the jury must be satisfied that the evidence for the prosecution has established beyond a reasonable doubt that the prisoner was actually present at the time and place when and where the crime was committed, and that he participated therein. (W. M. M.)

ALIENATION, in law, is any means of transferring real estate whereby it is voluntarily resigned by one man and accepted by another. In general, any person of legal discretion can alien, and to any person except those specially excepted, as, *e. g.*, aliens and corporations are in part. Alienation may be by deed, matter of record (*i. e.*, proceedings preserved in the courts of record), special custom (custom prevailing only in particular localities), or devise. In Anglo-Saxon times the right of alienation was very general, and could be exercised by will (devise) as well as by deed; but on the complete introduction of the feudal system after the Norman Conquest it was greatly restricted (such being the policy of that system); and indeed there could be no alienation without the consent of the lord of the fee and of the presumptive heir, as well as of the actual tenant. The grant by a lord of an estate to a man "and his heirs" was held to convey vested rights to the heir as well as to the original feudatory; and these rights of the heir could not originally be defeated by the ancestor. In those early days the usual form of alienation was subinfeudation, the outright sale of an estate being practically unknown. Gradually, the restrictions on alienation wore away, and finally the statute of *Quia emptores* (18 Edw. I. cap. 1) conferred on all tenants the right to alien their estates, enacting at the same time that their alienees should hold the estate of the same lord under whom the alienor had held; thus preventing the further extension of subinfeudation. Judicial decisions and statutes have now extended the right almost universally, even to entailed estates.

In America, more especially since the Revolution, the policy having been adverse to the growth of great estates, the effect of legislation has been to extend the right of alienation as far as possible, and land has become in effect a matter of commerce. (W. M. M.)

See Vol. I. p. 506 Am. ed. (p. 574 Edin. ed.).

ALIENS. In determining the citizenship of an individual two elements are to be considered—the place of birth, and the nationality of the parents. The nations of continental Europe, following the example of the early republics, make a person's citizenship depend largely upon that of his parents. But under the common law of England the question was determined almost entirely by reference to the place of birth, and every person born within the dominions of the Crown, whether of English or foreign parents, was an English subject, except children of foreign ambassadors or of foreign enemies occupying English territory. The converse of this doctrine led to the conclusion that every person born out of the jurisdiction of England was an alien. But the inconvenience of a rule making the place of birth the sole criterion of nationality was early felt as England's intercourse with other nations increased and children of English parents were frequently born in foreign states. The act 25 Edw. III. stat. 2, entitled "A statute for those that be born beyond the sea," was accordingly passed as the first step towards recognizing the importance of the nationality of one's parents as an element in determining his citizenship. This statute has been followed from time to time by others, until now all persons whose fathers are entitled to the rights of natural-born citizens, though born within the dominions of foreign states, are considered British subjects, as well as those born within the dominions of the Crown, except those whose parents are attainted of high treason.

The law of England as to the effect of the place of birth upon the nationality of an individual became the law of America, being part of that law of the mother country which the original settlers brought over with them. In place, however, of the British acts relating to persons born out of the realm, an Act of Congress, passed Feb. 10, 1855, governs in the United States. By this statute it is provided that "persons heretofore born or hereafter to be born out of the limits and jurisdiction of the United States, whose fathers were or shall be at the time of their birth citizens of the United States, shall be deemed and considered, and are hereby declared to be, citizens of the United States; provided, however, that the rights of citizenship shall not descend to persons whose fathers never resided in the United States." From this account of the history of the law of aliens, in so far as it relates to the determination of citizenship, it appears that an alien in the United States is one born out of the jurisdiction of the United States, whose father never resided in them as a citizen, and who has never been naturalized under their Constitution and laws.

It may be remarked in reference to the citizenship of women that by the common law, contrary to the laws of other nations, marriage did not affect their nationality. This was changed in England by statute, and in the United States also by the 2d section of the Act of Feb. 10, 1855, which provides that a woman who might be naturalized under existing laws becomes a citizen by marriage with a citizen of the United States; and it has been held under this act that a woman who marries an alien, who is afterwards naturalized, becomes herself a citizen. 2 Kent's *Com.*, 49.

As the early settlers of America brought with them that portion of the common law of England which related to the determination of a person's citizenship, so also the principles of the common law relating to the disabilities of aliens originally obtained in this country, and they were prohibited from exercising many political and civil privileges. They could not vote, hold civil office, or take any active part in the administration of the government. They were said to have no inheritable blood, and therefore could not receive title to real estate by descent, nor could they take as tenants by the courtesy or in dower; and if an alien purchased land, he held it subject to the rights of the existing government, and could be divested of the fee by what was called an *inquest of office*. Until thus divested he might hold land by purchase or devise, but upon his death it escheated to the commonwealth, since he could not transmit by hereditary descent. These disabilities still obtain in the United States, except as changed by statute. The tendency of modern legislation is, however, to do away with the restrictions placed upon aliens by the common law, at least in respect to their ability to take, hold, and transmit title to real estate. Thus, under certain acts of Congress public lands may be purchased by them, and a good title acquired. The right of an alien to hold land not belonging to the United States is governed by the laws of the State in which it is situated, and in most of the States it has been enacted, substantially, that aliens may take, hold, convey, and devise real estate in the same manner as native citizens. This is the case in Alabama, Arkansas, Colorado, Florida, Georgia, Illinois, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Jersey, North Carolina, Ohio, Oregon, Rhode Island, South Carolina, Tennessee, Texas, Virginia, West Virginia, and Wisconsin; so also in New Hampshire if the alien is a resident, and in Connecticut if a resident of the United States or of France. In Delaware and Kentucky aliens who have declared their intention to become citizens are wholly relieved of disabilities respecting real estate; and in California, if residents of the United States, but if not, they must come and claim their land within five years. In New York they are still somewhat hampered by the common-law rules; and in Pennsylvania they may take and hold land by devise or descent without limit, but can only purchase to an amount not exceeding five thousand acres in quantity or in net annual income of twenty thousand dollars. The common-law rules have never been changed by statute in Vermont, but they are not enforced. These statutory enactments refer, of course, to alien friends. When an alien owes allegiance to a power at war with the United States he is said to have no rights or privileges except by special favor of the government. But it is the tendency of modern law to grant him protection for his person and property until he is ordered out of the country, and for this purpose he may sue and be sued. There is nothing to prevent an alien friend from acquiring, holding, and transmitting personalty in the United States, and his rights in respect to such property, as well as those which affect his person and character, may be enforced by him in our courts.

Although many of the disabilities to which aliens were formerly subjected in respect to their dealings with real estate have been removed by statute in the several States, yet the fact still remains that they are prohibited from enjoying political rights, and this is sufficient to induce those who have come to this country with the intention of making it their home to desire to become citizens. This end may, of course, be attained by means of naturalization.

Before the adoption of the Constitution of the United States each State exercised the right to naturalize aliens, but it was therein provided that "Congress shall have power to establish a uniform rule of naturalization." Numerous statutes have been passed in pursuance of this authority which have superseded the enactments of the several States. Under the Acts of April 14, 1802, and May 26, 1824, an alien desiring to be naturalized must declare upon oath before certain specified courts his desire to become a citizen of the United States and to renounce all allegiance to foreign powers; two years later he must apply to be admitted, and declare upon oath that he will support the Constitution of the United States, and that he renounces allegiance to all foreign powers, especially to that of which he is a subject. It must also appear that he has resided in the United States for at least five years, and in the State where his application is made for at least one year, and is a man of good moral character and attached to the principles of the Constitution of the United States; and he must renounce any title of nobility. By the Act of May 26, 1824, it is further provided that an alien under the age of twenty-one who has resided in the United States for three years next preceding his arrival at that age, and who has continued to reside there up to the time of making application, may be admitted to citizenship without having previously made the declaration required by the Act of 1802, but he must satisfy the court that for the two years previous it has been his intention to become a citizen. By the Act of July 17, 1862, it is provided that any alien who has enlisted in the armies of the United States, and has been honorably discharged, may become a citizen upon petition and proof of one year's residence in the United States; and under the Act of June 7, 1872, foreign seamen who have served for three years on a United States merchant-vessel may be naturalized. These are the principal statutes now in force in reference to this subject.

As a result of naturalization in the United States, one who was an alien becomes entitled to the privileges and immunities of a native-born subject, except that under the Constitution no one is eligible as a Representative in Congress who has not been seven years, or as a Senator who has not been nine years, a citizen of the United States; and no one but a native-born citizen is eligible to the office of President or Vice-President of the United States. (C. H. B.)

ALIMONY, in law, the allowance which a husband pays by order of court to his wife, while living separate from her, for her maintenance. Alimony is the usual concomitant of a suit for divorce or legal separation, and may be either *pendente lite* or permanent.

See Vol. I. p. 508 Am. ed. (p. 576 Edin. ed.).

Alimony *pendente lite*, or temporary alimony, is an allowance ordered by the court for the support of a wife pending legal proceedings instituted either by or against her to obtain a divorce or legal separation. It usually includes an amount known as suit-money, to enable the wife to bear the expenses of litigation. Alimony *pendente lite* is only granted where it is made to appear that the wife has no adequate means to support herself or to carry on the suit.

Permanent alimony is an allowance ordered by the court to be paid by a husband for the support of his wife after the entry of a decree of divorce or separation. It is usually made to extend throughout the joint lives of the parties.

Alimony was originally allowed only in cases of legal separation or of divorce *a mensa et thoro*, and never in cases of divorce *a vinculo*; but this rule has been generally relaxed by statute. Where the wife has a separate estate sufficient for her maintenance, or where the husband has made a suitable settlement for her support, no alimony will be decreed; nor, as a rule, will it be allowed where the wife has been in fault, having committed the offence for which the separation or divorce has been granted. In some States, however, the courts are vested with power even in such cases to grant alimony if they see fit.

The courts will not decree to the wife as alimony a gross sum or any specific part of her husband's estate, but will decree a continuous allotment of sums payable at regular periods for her support from year to year. As to what the amount of the allowance will be, no definite rule can be laid down. Each case stands to a great degree upon its own footing. In arriving at a conclusion the courts will consider the incomes of the husband and wife respectively, their rank and condition in society, their age, health, and peculiar needs; whether there are children or other relatives to be supported, and upon whom the burden thereof devolves; the nature and extent of the husband's culpability; the demeanor and conduct of the wife to the husband during cohabitation;—in short, all the attendant circumstances. As a rule, the court will not decree more than one-half of the husband's income, or less than one-fourth, as alimony. One-third is considered a reasonable and liberal allowance.

Where a decree of alimony has been entered, the court may at any time and from time to time, on any change in the circumstances of the parties, either increase or diminish the amount of the allowance. Where either party dies the alimony terminates. (L. L., JR.)

ALIZARINE, ARTIFICIAL. The complete revolution which has taken place in the last twelve or fourteen years in the preparation of alizarine for use as a dye-stuff, and the great development which has attended the dyeing industries connected with it, make special mention of this new production of an old material necessary. While, according to Pliny and Dioscorides, the tinctorial power of the madder-root was known to the ancients, and while already in the sixteenth century the cultivation of the madder-root was begun in Silesia and Holland, and in the second half of the eighteenth century in Alsace and the south of France, the active coloring-principle *alizarine* was only discovered in 1824 by Robiquet and Colin. The cultivation of the madder-root had developed meanwhile, especially in the department Vaucluse in France, until in 1873 nearly 50,000,000 kilogrammes of madder-root, containing 1 to 1½ per cent. of dye-stuff and valued at over $11,000,000, were produced. From this time it fell off, while the amount of artificial alizarine (in the form of 10 per cent. paste) rose from 150,000 kilogrammes in 1871 to 4,500,000 kilogrammes in 1875 and 9,500,000 kilogrammes in 1878, valued at $7,250,000.

Artificial alizarine is made from anthracene, one of the hydrocarbons of coal-tar. It is contained in that portion of the distillate which goes over at from 320° to 360° C., and which was formerly used as a lubricant under the name of *green grease*. This consists of heavy oils and some 20 per cent. of anthracene. The green mass is pressed both cold and hot, and the cakes of crude anthracene so obtained are treated with petroleum naphtha to extract the admixed oils, and from the residue the anthracene is sublimed as a dry powder. Anthracene, $C_{14}H_{10}$, is then oxidized by the aid of a solution of bichromate of potash and sulphuric acid, and the resulting anthraquinone, $C_{14}H_8O_2$, is purified either by sublimation or more generally by a treatment with three or four times its weight of sulphuric acid. The anthraquinone is thus changed into either anthraquinone monosulphonic acid, $C_{14}H_7O_2(HSO_3)$, or anthraquinone disulphonic acid, $C_{14}H_6O_2(HSO_3)_2$, by the action of Nordhausen sulphuric acid. The acid is then neutralized with calcium carbonate, and after filtration from the sulphate of lime is treated with sodium carbonate until the lime is removed. This leaves in solution the sodium salt of the sulpho-acid, which solution is then evaporated to dryness and the residue fused with caustic soda at a temperature of from 250° to 270° C., whereby sodium alizarate is formed. This is dissolved out with water, and, on addition of hydrochloric or sulphuric acid, the alizarine, $C_{14}H_6(OH)_2O_2$, is precipitated in orange-yellow flocks, which are washed, but not dried, as it is put on the market as a watery paste containing 10 per cent. of pure alizarine.

If the alizarine has been produced by the aid of the anthraquinone monosulphonic acid, its red shades will have a bluish tint; if, on the contrary, with the anthraquinone disulphonic acid, a yellowish tint. In this latter case there is produced along with the alizarine a second coloring-matter, purpurine, $C_{14}H_5(OH)_3O_2$, which also accompanies the natural alizarine in the madder-root. Pure alizarine gives with alumina as mordant a bluish-red or violet color, purpurine or isopurpurine, the pure fiery-red color so prized under the name of "Turkey-red," and flavo-purpurine, which is also produced in the disulpho-acid process, a yellowish-red color.

Various colored derivatives of alizarine have also been introduced, and have attained commercial importance. Among these may be mentioned alizarine blue, $C_{17}H_{19}NO_4$, introduced in 1878 as a substitute for indigo blue; alizarine carmine, which is a mixture of the sulpho-acids of alizarine and purpurine; alizarine orange, or nitro-alizarine, $C_{14}H_7(NO_2)O_4$; and alizarine brown, prepared from this last by the action of hyposulphite of soda and caustic soda.

The production of artificial alizarine forms one of the most brilliant pages in the history of recent chemical achievement. Graebe and Liebermann, studying the quinone group of compounds, a class discovered shortly before by Graebe himself, were led from theoretical grounds to ascribe to the alizarine of the madder-root the character of a quinone. They then proceeded to ascertain the hydrocarbon from which it was derived; and on finding this to be anthracene, they attempted to build up the alizarine from this as a basis, and with the success already narrated. Their first patents were taken out in 1868, but they have been considerably amplified since. (S. P. S.)

See Vol. I. p. 509 Am. ed. (p. 578 Edin. ed.).

ALKALOIDS. Under this head are to be classed a number of chemical compounds of great interest to the physician as possessing in a more or less marked degree toxic and physiological power. They have been defined as vegetable bases containing nitrogen, but this definition has to be widened to allow of the mention, as alkaloids, of artificial bases, such as those derived from coal-tar and animal oils, those recently described as forming in the cadaver as products of the decomposition of animal tissues, and a number that have been formed by synthesis from simpler compounds. A more comprehensive chemical definition will therefore have to be given, and will probably be found in the fact that all these bases are *amines*, or ammonia derivatives of greater or less complexity. We shall make brief mention of the more important ones under the several heads of vegetable bases, both volatile and non-volatile, artificial alkaloids formed by destructive distillation, artificial alkaloids formed by synthesis, and "ptomaines," or bases formed in the decomposition of animal tissues.

The volatile vegetable bases are few in number, and are apparently less complex than the non-volatile or fixed bases. They are—

1. *Conine*, $C_8H_{15}N$, a colorless oily liquid extracted from *Conium maculatum*, or hemlock, in which it is accompanied by two other alkaloids, *methyl-conine*, $C_8H_{14}N(CH_3)$, and *conhydrine*, $C_9H_{17}NO$. Conine possesses the odor of the hemlock, is powerfully poisonous, dilates the pupil of the eye, and causes convulsions, palsy, and delirium.

2. *Nicotine*, $C_{10}H_{14}N_2$, exists in tobacco in different proportion in different varieties, varying in amount from 2 per cent. to 8 per cent. It is a colorless oily liquid which turns brown on exposure to light and air, has the odor of tobacco, and is extremely poisonous. It is a powerful sedative. Two or three drops prove fatal to dogs by causing asphyxia.

3. *Lobeline* exists in *Lobelia inflata*, or Indian tobacco. It has the odor of the plant, contracts the pupil, acts as an expectorant in small doses, as an emetic in larger. As a poison it is similar to nicotine.

4. *Methyl-amine*, CH_3NH_2, and *Trimethyl-amine*, $N(CH_3)_3$, simple ammonia derivatives, have also been found existing in plants.

The non-volatile vegetable bases include—

1. *The Cinchona Alkaloids*, including *quinine* and *quinidine*, $C_{20}H_{24}N_2O_2$, *cinchonine* and *cinchonidine*, $C_{20}H_{24}N_2O$, together with some half a dozen less important and rarer bases. These bases all occur in the bark of the several species of *Cinchonaceæ*, indigenous in Peru and the slopes of the Andes, but cultivated largely also in India and Java. They are remarkable for their febrifuge and general tonic properties. The bases themselves are not used in medicine, but their salts, such as the sulphate, hydrochlorate, acetate, etc.

2. *The Opium Alkaloids.* Opium is the dried and hardened juice of the capsules of the poppy-plant (*Papaver somniferum*). It contains some fifteen or more alkaloids, of which the most important are *morphine*, $C_{17}H_{19}NO_3$, *codeine*, $C_{18}H_{21}NO_3$, *narcotine*, *narceine*, *thebaine*, and *papaverine*. Of these morphine is present in largest amount, and is much the most important, although thebaine is the most actively poisonous. The base, morphine, is not used, but its salts. Their action is that of a sedative and anodyne, but in larger doses they are powerful narcotic poisons.

3. *Alkaloids of the Strychnos species*, including *strychnine*, $C_{21}H_{22}N_2O_2$, *brucine*, $C_{23}H_{26}N_2O_4$, and *curarine*, $C_{10}H_{15}N$. The former two occur in the seeds of the *Strychnos nux-vomica* and the *Strychnos Ignatiæ*, or St. Ignatius's bean; the last named is the active principle of the South American arrow-poison, *curari*. The salts of strychnine are active and very rapid poisons, producing tetanic convulsions and lockjaw, followed by death.

4. *Aconitine*, $C_{33}H_{43}NO_{12}$, from the leaves and root of *Aconitum Napellus* (monkshood) and allied species (see article ACONITE, in this volume), is one of the most violent poisons known, inducing complete muscular paralysis, followed by death.

5. *Atropine*, $C_{17}H_{23}NO_3$, from the leaves and root of *Atropa belladonna* (deadly nightshade), is poisonous in doses of one grain, and dilates the pupil of the eye strongly.

6. *Caffeine*, or *Theine*, $C_8H_{10}N_4O_2$, occurs in tea, coffee, and other vegetables used in the preparation of beverages in various parts of the world, in quantity from 2 to 5 per cent. Its general effect is that of a stimulant, though in large doses it is distinctively poisonous.

7. *Duboisine* (*Daturine* or *Hyoscyamine*). Under this name is found an alkaloid associated with atropine, and possessing similar physiological action.

8. *Piperine*, $C_{17}H_{19}NO_3$, contained in the various species of pepper.

9. *Theobromine*, $C_7H_8N_4O_2$, contained in the seeds and leaves of *Theobroma cacao* (cacao bean), and, like caffeine, to which it is chemically related, is a stimulant, constituting the basis of chocolate preparations.

10. *Veratrine*, $C_{32}H_{52}N_2O_8$, contained in the several *Veratrum* species, is a powerful alkaloid, producing vomiting and frothing at the mouth. The slightest trace applied to the nostrils causes violent sneezing.

The alkaloids formed artificially by destructive distillation are chiefly those obtained from coal-tar, from bone-oil (Dippel's oil), and by the distillation and decomposition of some of the vegetable bases themselves. They are in general much more simple in formula, and are readily shown to be amines or ammonia derivatives. Thus in coal-tar are found aniline, $C_6H_5NH_2$, and its homologues toluidine and xylidine; the pyridine series of bases beginning at pyridine, C_5H_5N, and including some five homologous bases; the leucoline or chinoline series beginning with chinoline, C_9H_7N. Bone-oil, an analogous product of destructive distillation, is especially rich in the pyridine series. Quinine, cinchonine, strychnine, and other vegetable alkaloids yield on destructive distillation chinoline and its isomers. All of these compounds are basic, and form salts in every way analogous to those of the vegetable alkaloids.

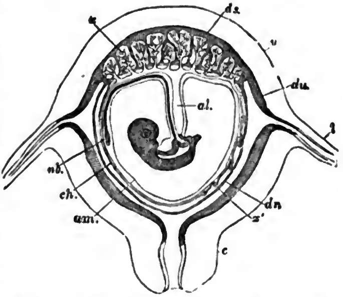
The attempts that have been made towards the formation of alkaloids synthetically are closely connected with the study of the products just mentioned. It was recognized that as they were simpler in molecular formula than the natural bases, and were formed when these latter were decomposed by heat, they would likely prove useful as steps in the building up of these most valuable medicinal products. The first alkaloid formed artificially was conine, or rather an alkaloid of the same chemical composition called *paraconine*. It has powerful physiological properties, and is very similar to conine in its action. From morphine, by the action of hydrochloric acid under pressure and heat, has been produced an alkaloid, *apomorphine*, which is quite active in its physiological influence, and is largely availed of. The synthesis of morphine and codeine seems quite likely to be accomplished in the near future, as they have been recently shown to be derivatives of phenanthren, one of the hydrocarbons of coal-tar. As quinine and cinchonine both yield chinoline by destructive distillation, and similar products under the influence of weak oxidizing agents, they are very likely complex derivatives of this simpler base, and efforts are now making to effect their synthesis with the aid of chinoline. Atropine has not only been made artificially from two of its decomposition products, tropine and tropic acid, but the base tropine has been made to combine with a series of organic acids yielding a number of new alkaloids known under the general name of *tropeines*. Several of these have well-marked physiological power, and are being used in ophthalmological clinics. Piperine, the alkaloid of pepper, has been made by a method entirely analogous. Lastly, caffeine or theine has been shown to be a derivative of xanthine, a constituent of guano, and has been made from this base. Theobromine is similarly related to xanthine, and has been made from it.

The last class included under the heading of alkaloids have been only recently brought to notice. It has been found that during the progress of putrefaction in animal remains bodies called *ptomaïnes* are produced. These are nitrogenous bases, and frequently resemble very closely in physiological and chemical characteristics the vegetable alkaloids. Some of these cadaveric substances are narcotic like morphine, while others resemble in symptoms produced the alkaloids strychnine and atropine, compounds having different physiological actions, being produced at different stages of decay. Organic bases containing arsenic, and probably other metallic elements, may also be formed in cases where the compounds of these elements had been introduced into the system previous to death. Selmi, who has made a special study of this class of compounds, records several cases in which strongly poisonous and crystalline ptomaïnes were found by him in exhumed bodies containing arsenic.

It is of course obvious that these cadaveric alkaloids may be mistaken for vegetable alkaloids in cases of examination of human remains any considerable time after death. Such a case was reported in Italy, where experts declared that an individual had been poisoned with delphinine, when it was afterwards proved to be a ptomaïne. A method of distinguishing between these bases and the natural alkaloids has been proposed, based upon the fact that ferricyanide of potassium is not acted upon by solutions of vegetable alkaloids, but is reduced to ferrocyanide by a ptomaïne salt. Two exceptions appear, however, to exist, morphine and veratrine, both of which reduce the ferricyanide to a greater or less degree. Our knowledge of these cadaveric alkaloids is as yet very incomplete, but their study is absolutely necessary for all interested in toxicology or medico-legal investigations. (S. P. S.)

ALLAN, Sir Hugh (1810–1882), an eminent promoter of Canadian interests, was born at Saltcoats, Ayr, Scotland, Sept. 29, 1810. His father, Capt. Alexander Allan, was long engaged in navigation between Scotland and Canada. In 1825, Hugh became a clerk in a prominent shipping-house, but at his father's suggestion he removed to Canada about a year later, landing in Montreal, May 21, 1826. Here he became clerk in a dry-goods house, and devoted his leisure time to useful studies. In 1830 he revisited Scotland, and on his return to Montreal entered the shipping-business—first as a clerk; in 1835 he became a partner in the firm, in which he remained till his death. The successful establishment of screw-steamers on the Atlantic led to projects for a line from Great Britain to the river St. Lawrence. Mr. Allan had already built the Canadian and the Indian, which were used by the British Government in the Crimean War, and with these and two others, the North American and the Anglo-Saxon, the line was established in 1856. The ships carried the mail and ran fortnightly to and from the St. Lawrence during open navigation, and monthly to and from Portland, Me., during the winter. In May, 1859, a weekly service was commenced, four new steamers being added. A line was afterwards established to Glasgow by the same firm, and numerous sailing-vessels were sent in every direction. The Allan line continued to increase until it became the largest steamship company in the world. Mr. Allan took part also in numerous manufacturing, mining, railroad, and telegraph enterprises, and accomplished much for the development of Montreal and of Canada. In recognition of his valuable services to the commercial prosperity of her dominions in America, Queen Victoria bestowed on him in 1874 the honor of knighthood. Though advanced in years, he continued to attend diligently to business. He visited Scotland in 1882, and was about to return to his family, when he died of heart disease at Edinburgh, Dec. 9, 1882. His fortune was estimated to exceed $6,000,000.

ALLANTOIS (Gr. ἀλλᾶς; gen. ἀλλᾶντος, a sausage), in anatomy, one of the fœtal structures, part of which, inside the body, is developed into permanent organs, that part which is external being eventually cast off with other fœtal annexes. It is developed in Mammalia, Aves, and Reptilia, in which classes of vertebrates it acquires a respiratory, circulatory, or nutritive function; but is wanting, or at most rudimentary, in Batrachia and Pisces. Hence its appearance is nearly coincident with that of an amnion. After the appearance of the umbilical vesicle, which is in all vertebrates the earliest fœtal appendage and the primitive organ of circulation, the allantois begins as an outgrowth of the mesoblast from the under surface of the latter, behind the alimentary tract. It assumes a vesicular form, containing a cavity lined with cells from the hypoblast, and may continue in that shape, depending from the body of the embryo, or form connection with the chorionic membrane and contribute to form the umbilical cord and placenta. Its development is generally



Diagrammatic section of pregnant human uterus, showing allantois, amnion, etc. (After Huxley.) *u*, the uterus; *c*, its cervix; *l*, fallopian tube; *du*, decidua vera; *ds*, decidua serotina; *dr*, decidua reflexa; *ch*, chorion, the outer fœtal envelope, lying between amnion and maternal decidua; *z*, *z'*, chorionic villi; *am*, amnion (see Amnion), the sac immediately enclosing the fœtus; *ub*, umbilical vesicle, now lying shrunken between the amniotic and chorionic membranes, while the increasing allantois, *al*, is forming most of the umbilical cord and placenta ("navel-string" and "after-birth").

in inverse ratio with that of the umbilical vesicle, both as to the respective dimensions and functional importance of these two structures, and as to the time at which they are at their respective heights of development. In the placental Mammalia the umbilical vesicle soon shrinks and wastes away, and lies useless between the amniotic and chorionic layers, while the allantois grows and maintains its functional activity throughout gestation. Its cavity originally communicates with that of the intestinal tract, and receives the excretion of the Wolffian bodies, or primitive kidneys; it receives the hypogastric arteries from the aorta, and returns blood from the placenta by the umbilical vein or veins. Its cavity is variously transformed; that part which is extra-fœtal soon disappears, leaving the navel cord to consist chiefly of the blood-vessels, enveloped in a jelly-like substance and invested with a reflection of the amnion; a part of the cavity within the body of the fœtus is also obliterated in due course, constituting, with the obliterated arteries, the fibrous cord known as the urachus, while so much of the allantoic cavity as persists is modified into the bladder or other urinary passage, which may or may not continue to maintain its original connection with the cavity of the alimentary tract. In placental mammals the urinary and digestive tracts become completely separated. At birth the entire extra-fœtal part of the allantois is cast off with the other fœtal annexes. (See AMNION.) (E. C.)

ALLATIUS, LEO (1586–1669), an eminent Roman Catholic controversialist and author, was born in Scio in 1586. At the age of nine he went to Calabria, and a few years later to Rome, where he was educated in the Greek school in literature, philosophy, and theology. Gifted with quick perception and a retentive memory, he became one of the most learned men of his time. For some years he studied medicine under Julius Lagalla, whose biography he afterwards published (Paris, 1644). He was closely associated with ecclesiastical affairs, but never took orders, though he never married. He was employed as librarian and in other capacities by several cardinals and popes, and finally, in 1661, was made keeper of the Vatican Library. He died in Jan., 1669, leaving his little property for the education of three youths of his native island. The Greek authors whose works he edited were chiefly those of the later Empire, but he published several original works in Greek and Latin and a few in Italian. His most important labors were in behalf of the Latin Church in its dispute with the Greek, and his works on this question are still of some value. The principal is *De Ecclesiæ occidentalis atque orientalis perpetua consensione* (Coloniæ, 1648). In his *Apes Urbanæ* (Rome, 1633) he gives an account of the literary men at Rome at that time.

ALLEGAN, the county-seat of Allegan co., Mich., is on both banks of the Kalamazoo River, 25 miles from Lake Michigan. It is on the Kalamazoo branch of the Lake Shore and Michigan Southern Railroad, the Grand Rapids and Indiana Railroad, and the Chicago and West Michigan Railroad. The Kalamazoo River is navigable for steamboats, and furnishes abundant water-power for manufactories. Allegan has four flour-mills, two planing-mills, two machine-shops, a saw-mill, paper-mill, woollen mill, furniture-factory, and wagon-factory. It has four hotels, a national bank, Holly water-works, eight churches, four school buildings, three newspapers, and a literary association. It was first settled in 1834. Population, 2305.

ALLEGHENY CITY, a city of Allegheny co., Pa., on the Allegheny River opposite Pittsburg, with which it is connected by six bridges. It is a terminus of the West Pennsylvania division of the Pennsylvania Railroad, and is on the Pittsburg, Fort Wayne, and Chicago Railroad and the Pittsburg and Western Railroad. It has increased rapidly in the last decade. It contains about fifty churches, three national banks, several State, private, and savings banks, the Western Penitentiary, a public library, three theological seminaries (Presbyterian, Reformed Presbyterian, and United Presbyterian,) and several convents and charitable institutions. One daily and two weekly newspapers are published here. The city has a large park, extensive water-works, and street-railways; also numerous machine-shops, iron-foundries, rolling-mills, tanneries, salt-works, and manufactories of locomotives, cotton goods, flour, beer, etc. The city is supplied with water from the Allegheny River. The population in 1880 was 78,682.

ALLEGHENY COLLEGE, an institution under the control of the Methodist Episcopal Church, is situated at Meadville, Crawford co., Pa. The meeting at which it was resolved to establish this college was held at Meadville, June 20, 1815. Rev. Timothy Alden was appointed president, as well as professor of Oriental languages and ecclesiastical history; Rev. Robert Johnson was made vice-president and professor of logic, metaphysics, and ethics. These were the sole instructors, though provision was made that the principals of public academies in the north-western part of Pennsylvania might be regarded as members of the faculty. The president immediately set out on a tour to raise funds for the new institution, and obtained $4103, chiefly in Boston. The citizens of Meadville and the vicinity, besides presenting the land on which the college stands, subscribed about $6000. The charter of incorporation bears date March 17, 1817, and the legislature of Pennsylvania by the same act appropriated $2000 to the institution; on July 4 the charter was accepted, and on the 28th the first commencement was held. Dr. Allen during his tour in the East had endeavored to procure not only money, but also books, as essential to the existence of the college. Rev. Wm. Bentley, D. D., of Salem, Mass., bequeathed to the college his valuable library, and his example was followed by Hon. James Winthrop, LL.D., of Boston. Isaiah Thomas of Worcester, Mass., the well-known antiquarian, also presented a number of books. In memory of Dr. Bentley's benefactions the original college building is now called Bentley Hall.

Dr. Alden resigned the presidency in 1832, and after an interval of a year the college, which had heretofore been under Presbyterian control, passed to the Pittsburg conference of the Methodist Episcopal Church, after which Rev. Martin Ruter, D. D., was chosen president. Under his management a full corps of professors was engaged and a large number of students was soon in attendance. Rev. Homer J. Clark, who became president in 1837, introduced the scholarship-endowment plan. From 1838 to 1844 State aid to the amount of $1000 annually was received. But for two years subsequently the college was closed while Dr. Clark journeyed about in search of funds. He secured subscriptions for scholarships to the amount of $100,000, of which $60,000 were collected and invested. In 1847, Rev. John Barker, D. D., a man of great personal magnetism as well as teaching-power, was elected president, and remained in office until his death in 1860. During his administration the second college building, Ruter Hall, was built in 1852. Rev. George Loomis, D. D., was elected president in 1860 and resigned in 1874. His administration was one of great labor and marked success. In 1870 young women were first admitted to the privileges of the institution, and coeducation, though at first opposed by some of the trustees, has proved a success. After the retirement of Dr. Loomis, Rev. Jonathan Hammett, D. D., was acting president for one year. In 1875, Rev. Lucius H. Bugbee, D. D., then president of the Cincinnati Wesleyan College, was transferred to Allegheny College. Dr. Bugbee resigned the presidency in June, 1882. During his administration the attendance of students was more than doubled, the revenues were largely increased, the library and laboratories improved, the chapel enlarged and beautified, and the finest college building, Hulings Hall, for young ladies, was erected. A preparatory school was opened in connection with the college in 1876. The military department, established in 1877, has proved highly successful. Besides the president, there are seven professors in the college proper, one in the preparatory school, and two lady-instructors. The aggregate number of students in 1881 was 280, of whom 26 graduated. The total number of graduates is 645, while not less than eight thousand pupils have received here at least part of their education. The grounds and buildings are now valued at $140,000, while the library and apparatus are worth $90,000; the permanent investment fund is $170,000, belonging equally to the Erie and Pittsburg conferences of the Methodist Episcopal Church.

Among the noted alumni are Bishop Calvin Kingsley, Gov. F. H. Peirpoint of Virginia, Rev. Cyrus Nutt, D. D., president of Indiana State University, Rev. Alexander Martin, D. D., president of Indiana Asbury University, Rev. O. N. Hartshorn, LL.D., president of Mount Union College, Rev. James Marvin, D. D., chancellor of Kansas State University. In all departments of life, civil, religious, and military, at home and in distant lands, the college is honored by the record made for her by the lives and deaths of her graduates. (L. H. B.)

ALLEN, ETHAN (1738–1789), an American Revolutionary general, was born at Litchfield, Conn., Jan. 10, 1738. About 1763, with four younger brothers, he removed to the neighborhood of Bennington, Vt., whither immigrants had been attracted by the liberal offers of land from Gov. Benning Wentworth of New Hampshire. As the governor of New York claimed jurisdiction over the territory and granted the same land to other settlers, a fierce dispute arose, and in 1764 the king, to whom appeal had been made, decided in favor of the claim of New York. Attempts were then made to eject the settlers under the New Hampshire grants, but these stoutly resisted, and in 1770 selected Allen to plead their cause at Albany. When the decision of the courts was finally adverse, he denounced armed resistance, using the characteristic quotation, "The Lord is the God of the hills, but He is not the God of the valleys" (1 Kings xx. 28). Allen was now made colonel of the Green Mountain Boys, who protected the New Hampshire grantees and drove out the New York settlers. In 1774, Gov. Tryon of New York issued a proclamation offering £50 reward for the capture of the other ringleaders, and £150 for Allen, who retaliated by offering a reward for the capture of Tryon.

In April, 1775, when tidings of the battle of Lexington spread through the western part of New England, the thoughts of the patriots turned at once to the famous Fort Ticonderoga, which was known to be well supplied with military stores and but feebly garrisoned. There was an eager race on the part of several leaders to get commissions, means, and men for the expedition. Ethan Allen and Benedict Arnold were among the foremost. The latter had a commission as colonel, obtained from Massachussetts, but the Green Mountain Boys had already reached Lake George when Arnold overtook them, and were not disposed at such a time to receive a new commander. Early on the morning of May 10, when only 83 of his men had crossed the lake, without waiting for others who were to join him, Allen pushed into the fort and summoned the astonished commander to surrender "in the name of the great Jehovah and the Continental Congress." The garrison consisted of only 50 men, but they had a large amount of artillery and arms, which fell into Allen's possession and were afterwards turned over to Col. Hinman of Connecticut. Arnold, who had taken an active part in the operations without waiving his claim to command, settled the question by resigning June 24. Allen wished to push his conquests into Canada, but not being able to get authority for this, repaired to Philadelphia, where he received the thanks of Congress for his services. In the same year he was employed by Gen. Schuyler on a secret mission to sound the views of the Canadians, and later, when on his way to Gen. Montgomery's expedition, was induced to take part in a rash adventure at Montreal, Sept. 25. Not being properly supported, his little band was captured, and he was sent in chains to England. He was soon sent back, and confined in prison-ships and jails at Halifax and New York, being harshly treated and kept heavily ironed most of the time; but afterwards, at New York, he was allowed restricted liberty on parole. He has given a full account of his treatment and of the British officers he met in a spirited *Narrative* first published in 1779. Alexander Graydon, a fellow-captive, has left in his memoirs a graphic sketch of Allen: "His figure was that of a robust, large-framed man worn down by confinement and hard fare. . . . His style was a singular compound of local barbarism, scriptural phrases, and Oriental wildness. . . . Notwithstanding that Allen might have had something of the insubordinate, lawless frontier spirit in his composition, he appeared to me to be a man of generosity and honor." When, after Gen. Burgoyne's surrender at Saratoga, Congress had secured Allen's release, May 3, 1778, he hastened to meet Washington at Valley Forge, and would have entered the regular service had not the troubles in Vermont broken out afresh. That State had declared her independence in 1777, and sought admission to the Confederation on equal terms with the other colonies, but this was strongly opposed by New York. Allen was appointed major-general of the militia, and also agent to Congress to secure her admission. Congress hesitated to offend the powerful State of New York, and the people became restive. The English commanders, taking advantage of this turn of affairs, tried to persuade Allen and other leaders to restore the king's authority, promising that Vermont should be an independent British province. In 1782, Allen sent their letters to the president of Congress, and when the war closed Vermont was a part of the Union, though not recognized as a State till 1791.

After the return of peace he lived mostly in retirement, composing a work on natural religion, which was published at Bennington in 1784 under the title *Reason the only Oracle of Man; or, A Compendious System of Natural Religion.* This book, written with all his force and extravagance of expression, was the first ever issued in America formally attacking Christianity. The greater part of the edition was destroyed by fire in the printing-office, and the volume is now very rare. He died suddenly of apoplexy at Colchester, Vt., Feb. 13, 1789. He is said to have believed in the transmigration of souls, and to have asserted that he had formerly lived on earth as a white horse. He was as generous and humane as he was courageous and eccentric, and, as he says himself, "inspired with a sincere passion for liberty." Biographies of Allen have been written by Jared Sparks in his *Library of American Biography*, 1836, by Hugh Moore, 1834, and by H. W. De Puy, Buffalo, 1853.

ALLEN, GEORGE, LL.D. (1808–1876), an American classical scholar, was born at Milton, Vt., Dec. 17, 1808. His father, Heman Allen (1776–1844), was an eminent lawyer and member of Congress from that State. The son graduated at the University of Vermont, and for two years after supplied the place of an absent professor. Dr. James Marsh, the president of the University, was one of the earliest disciples of Coleridge in America. Prof. Allen, under his guidance, became an enthusiastic admirer, and was afterwards active in extending the influence, of the great philosopher. He was admitted to the bar, but having become an Episcopalian, turned his attention to theology, and studied under Bishop J. H. Hopkins while assisting him in a seminary at Burlington. He became rector of the church at St. Albans, Vt., but resigned on account of weakness of the throat, and was chosen professor of ancient languages in Delaware College, Newark, Del. In 1845 he was called to a similar position in the University of Pennsylvania. His department was afterwards divided, and he remained professor of Greek. He was noted for the wide range and accuracy of his knowlege, being not only a thorough classical scholar, but also master of several modern languages, an excellent musician, a fair mineralogist, an authority in Shakespearian criticism, in military science, and in chess. His valuable attainments were always at the service of his friends and pupils, and, unfortunately, through them alone have been made accessible to the public. His valuable classical and Shakespearian libraries were purchased and presented to the University of Pennsylvania by some of his friends. His chess library, the best in America and one of the finest in the world, is now in the collection of the Ridgway Library of Philadelphia. His most noteworthy publication is the *Life of Philidor*, 1860, some copies of which were the first books ever printed on vellum in America, with the exception of a little devotional work to which his piety led him to give the precedence. In 1847 he became a Roman Catholic, and was for several years the consular representative of the Papal States. He died while on a visit to some friends at Worcester, Mass., May 28, 1876.

ALLEN, Grant, an English author, was born at Alwington, Kingston, Canada, Feb. 24, 1848. He is a grandson of Hon. Charles Grant, Baron de Longueuil, whose family was prominent in the early history of Canada, and he is also descended from Gen. John Coffin of Boston. He early displayed remarkable intellectual ability and great fondness for natural history. He was educated at first by his father, afterwards at a college in France, and then at King Edward School, Birmingham, England. He entered Oxford University in 1867, having won the post-mastership of Merton College, the first open classical scholarship, and graduated with honors in 1871. In 1873 he was appointed to the chair of logic and philosophy in Queen's College, Spanish Town, Jamaica, and in the next year became principal of that institution. After spending four years in Jamaica, he returned to England, where he has since devoted himself almost entirely to literature, contributing numerous articles on a great variety of subjects to *The Fortnightly*, *Contemporary*, and *Westminster* reviews, and various magazines. His principal works are—*Physiological Æsthetics* (1877); *The Color-Sense, its Origin and Development* (1879); *Anglo-Saxon Britain* (1880); *The Evolutionist at Large* (1881); *Vignettes from Nature* (1881); *The Colors of Flowers* (1882); and *Colin Clout's Calendar* (1882). He is perhaps the most attractive writer among modern naturalists, and uses his exceedingly minute studies of nature to illustrate the theory of evolution. He seems to have become entirely English in tastes and sympathies.

ALLEN, Ira (1751–1814), a brother of Ethan, was born at Cornwall, Conn., April 21, 1751. When the Revolution broke out he was inclined to the king's side, but afterwards served in the American army as colonel of the militia, taking part in the battle of Bennington. In 1777 he was a member of the convention which framed the constitution of Vermont, and became the first secretary of the State. In the spring of 1781 he was sent as commissioner to Canada in consequence of a threatened invasion, arranged an armistice, and by his subsequent negotiations saved the State. He was afterwards State treasurer, member of the council, and surveyor-general. He did much towards founding the University of Vermont in 1789, giving liberally in land, labor, and materials. He was appointed major-general of the militia, and in 1795 went to Europe to purchase arms. On his return voyage with muskets and cannon he was captured by an English vessel and carried to England. There he was tried in the court of admiralty on a charge of supplying the Irish rebels with arms, and after a suit of eight years was acquitted. During this time he published at London *The Natural and Political History of Vermont*. He was afterwards imprisoned in France. He died at Philadelphia, Jan. 7, 1814.

ALLEN, Karl Ferdinand (1811–1871), a Danish historian, was born April 23, 1811, in Copenhagen; studied at the University of Copenhagen, and travelled extensively in Holland, England, France, Italy, Norway, and Sweden for the purpose of making investigations in archives. In 1862 he was appointed professor of history and Northern archæology in Copenhagen. His chief works are—*Haandbog i Fædrelandets Historie* (Copenhagen, 1840; 7th ed. 1870), of which a German translation appeared in Leipsic in 1849 and 1855; *Lærebog i Fædrelandets Historie* (Copenhagen, 1842; 11th ed. 1873); and *De tre nordiske Rigers Historie*, from 1497–1536 (5 vols., Copenhagen, 1864–72). The latter is his chief work, and although he did not live to finish it, it is still one of the most important contributions to Scandinavian history. He also wrote *Om Sprog og Folkeeierdommelighed i Hertugdömmet Slesvig eller Sönderjylland* (Copenhagen, 1848) and *Det danske Sprogs Historie i Hertugdömmet Slesvig eller Sönderjylland* (2 vols., Copenhagen, 1857–58). He died in Copenhagen, Dec. 27, 1871.

ALLEN, William, D. D. (1784–1868), an American Congregational minister, educator, and author, was born at Pittsfield, Mass., Jan. 2, 1784. His father, Rev. Thomas Allen (1743–1810), was the first minister of that town, and retained his charge for nearly forty-six years, serving also part of the time as a volunteer chaplain in the Revolutionary army. William graduated at Harvard College in 1802, studied theology, and was licensed to preach in 1804. After spending a few months in missionary labor in Western New York, he was appointed a regent of Harvard College and assistant librarian. While holding this position he gave much time and labor to the preparation of his *American Biographical and Historical Dictionary*, the first edition of which appeared in 1809, being the first work of the kind ever attempted in America. It contained notices of about seven hundred Americans. He also contributed to Bogue and Bennett's *History of Dissenters* (London, 1807), furnishing biographical sketches of American ministers. In 1810 he succeeded his father in charge of the church at Pittsfield, but retained the position only six years. When the legislature of New Hampshire altered the charter of Dartmouth College in 1816, Dr. Allen was appointed president of the new institution, called Dartmouth University, but when, in 1819, the famous decision of the Supreme Court of the United States pronounced the act of the legislature unconstitutional, he was obliged to retire. He then became president of Bowdoin College, where he remained till 1839, with the exception of a brief interval in 1831, when the legislature of Maine undertook to control the affairs of the college on the ground that its original charter from Massachusetts had been surrendered and the new charter from Maine had placed the institution under its jurisdiction. Upon appeal, however, Justice Story, of the U. S. Circuit Court, sustained President Allen and restored him to his office. While at Bowdoin he published anonymously a treatise on the vexed question of the authorship of the "Junius" letters, attributing them to Lord George Sackville (*Junius Unmasked*, Boston, 1828). He also brought out in 1832 a second edition of his *Biographical Dictionary*, in which the number of persons noted was increased to 1800. His collection of *Psalms and Hymns*, published in 1835, contained several original hymns. After leaving Bowdoin he resided at Northampton, Mass., where he engaged in various kinds of literary work. He made large collections of English words not previously found in dictionaries, which he furnished to successive editions of Webster's and Worcester's dictionaries. He contributed sketches of several ministers to Sprague's *Annals of the American Pulpit*, and delivered some historical discourses. In 1857 the third edition of his *Biographical Dictionary* was published, containing notices of nearly 7000 Americans. To Dr. Allen's untiring labor in this field we are indebted for a knowledge of many of the worthies of colonial times. In later years he indulged still more the poetic vein, publishing *Wunnissoo; or, The Vale of Hoosatunnuk*, with learned notes, and some volumes of sacred poetry; *Christian Sonnets*, 1860, *Poems of Nazareth and the Cross*, 1866, and *Sacred Songs*, 1867. He died at Northampton, July 16, 1868.

ALLEN, William Francis, an American classical scholar, was born at Northborough, Mass., Sept. 5, 1830, and graduated at Harvard University in 1851. He has since been constantly engaged in teaching, with the exception of two years (1854–56) spent in Europe, and two years (1863–65) spent in the South in the service of the Western Sanitary and the Freedmen's Commissions. In 1867 he was elected to the chair of ancient languages and history in the University of Wisconsin at Madison, afterwards changed to Latin and history; which position he still occupies. His literary work, with the exception of articles in periodicals, is chiefly a series of Latin text-books published in connection with his brother, J. H. Allen, and J. B. Greenough of Harvard University. In 1867, in connection with Charles P. Ware and Lucy McKim Garrison, he edited a collection of *Slave-Songs*, the first work of the kind. Other works are—*Introduction to Latin Composition* (1870; revised 1880); editions of the *Agricola* (1880) and *Germania* (1881) of Tacitus; and *Reader's Guide to English History* (1882).

ALLIANCE, a flourishing village in Stark co., Ohio, is on the Mahoning River, at the junction of the Pittsburg, Fort Wayne, and Chicago Railroad with the Cleveland and Pittsburg Railroad. It is 57 miles S. S. E. of Cleveland and 82 miles N. N. W. of Pittsburg. It has an opera-house, two banks, six hotels, three weekly newspapers, twelve churches, and a union school. A large college building in the village is now unoccupied. The industrial works comprise two foundries, steam-hammer works, rake-factory, three machine-shops, hoe-factory, steel-factory, bone-mill, three planing-mills, two flour-mills, and a bag-factory. The village is neat in appearance, and is lighted with gas. It was settled in 1851, and incorporated as a village in 1854. The building of the railroads has greatly increased its prosperity. Its property is valued at $1,500,000; its public debt is about $80,000, and its yearly expenses $6000. Mount Union College is one mile south. Population, 4636.

ALLIBONE, Samuel Austin, LL.D., born in Philadelphia, Pa., April 17, 1816, was editor of the American Sunday-School Union from 1867 to May, 1879, and from that date has been librarian of the Lenox Library in the city of New York. He is author of—(1) *Review by a Layman of a Work entitled "New Themes for the Protestant Clergy,"* 12mo, Phila., 1852; (2) *"New Themes" Condemned*, 12mo, Phila., 1853; (3) *A Critical Dictionary of English Literature and British and American Authors, Living and Deceased, from the Earliest Accounts to the Latter Part of the Nineteenth Century*, containing over forty-six thousand (46,499) articles (authors), with forty indexes of subjects, royal 8vo, 3 vols., pp. 3139: Phila., 1858, 1870, 1871. It was projected in 1850; he commenced preparing for the printer Aug. 1, 1853, and read the last proof-sheet Dec. 31, 1870. "Far superior to any other work of the kind in our language," says Lord Macaulay on vol. i.; and it was also commended by Bancroft, Carlyle, Dickens, Everett, Felton, Sir Henry Holland, O. W. Holmes, T. H. Horne (of British Museum), Washington Irving, Archbishop Kenrick, Lieber, Longfellow, Lord Napier, W. H. Prescott, Sparks, Chief-Justice Taney, Ticknor, Presidents Walker, Wayland, Woolsey, Felton, and King, Cardinal Wiseman, Henry Reeve (editor of *Edinburgh Review*), Thackeray, Earl Stanhope, etc.; (4) *An Alphabetical Index to the New Testament*, 16mo, Phila., 1868; (5) *Union Bible Companion*, 12mo, Phila., 1871. Chapters i.–xxvi. of this book were also published separately under the title of *The Divine Origin of the Holy Scriptures*, etc.; (6) *Poetical Quotations from Chaucer to Tennyson, with Copious Indexes*, 8vo, pp. xiv., 788, Phila., 1873; (7) *Prose Quotations, from Socrates to Macaulay, with Indexes*, 8vo, pp. 764, Phila., 1876; (8) *Great Authors of All Ages, being Selections from the Prose Works of Eminent Writers from the Time of Pericles to the Present Day, with Indexes*, 8vo, pp. xvi., 555: Phila., 1880. He is also author of *Explanatory Question-Books on the Gospels and the Acts*, 1869, 2 vols.; indexes to Edward Everett's *Orations and Speeches*, 1850–59, 3 vols., 8vo, and to the *Life and Letters of Washington Irving*, 1861–64, 4 vols., 8vo; and of articles in *The North American Review, Gettysburg Quarterly Review, United States Service Magazine*, etc., and anonymous treatises.

ALLIES, Thomas William, an English Roman Catholic controversialist, was born Feb. 12, 1813, at a village in Somersetshire, where his father was a curate of the Church of England. After attending the grammar school at Bristol, he went to Eton in 1827, and two years later to Oxford, where he obtained a prize scholarship at Wadham College. He graduated in 1832, taking a first-class in classics, and in the next year obtained a fellowship in his college. After making a tour in France and Italy, he commenced the study of theology, and in Dec., 1837, was ordained deacon, and a year later priest, in the Established Church. Being directed by a friend to Rev. J. H. Newman's work on *The Prophetical Office of the Church*, he came completely under the influence of that eminent theologian. The central doctrine of his creed was the unity of the Church from the day of Pentecost to the day of judgment. Of this catholic Church he then believed the Anglican Church to be part. In 1838 he removed to London, and through the influence of Lord Alderson he was appointed in 1838 examining chaplain to Dr. Blomfield, bishop of London. In Jan., 1842, the bishop baptized the prince of Wales, one of the godfathers being the king of Prussia. When Allies remonstrated on the impropriety of allowing the latter to act, the bishop removed him to the rectory of Launton in Oxfordshire. Here he labored faithfully and studied the Church Fathers. In 1844 he restored his church at considerable expense, and also published a volume of sermons on the Epistle to the Romans. In 1845 his friend and guide, Rev. Dr. Newman, passed over to the Roman Church, and Allies, deeply affected, visited the Continent to examine the actual working of the Catholic Church. The result of this and other visits was embodied in his *Journal in France in 1845 and 1848, with Letters from Italy in 1847*. As in this he censured the Church of England for defects in dogma and discipline, Bishop Wilberforce was with difficulty restrained from prosecuting him. Allies then published *The Church of England Freed from the Sin of Schism* (1849). A visit to Italy followed, in which he received the pope's blessing at Gaëta, and returned to prepare a reply to his own book, called *The See of St. Peter* (1850). He was then admitted to the Roman Catholic Church by Father Newman, Sept. 11, 1850, but, as he was married, he was unable to enter the priesthood. Taking such employment as he could get, he also continued his writings, and in 1852 published *St. Peter, his Name and Office*. Since 1853 he has been secretary of the Catholic poor-school committee of Great Britain, and has done much to promote primary education. In 1853, through the influence of Rev. Dr. J. H. Newman, then rector of the Catholic University of Dublin, Allies was appointed lecturer on the philosophy of history, and delivered his inaugural lecture in that institution in Dec., 1854. Though the course was not completed, it served as the basis of his most important work, *The Formation of Christendom*, of which four volumes have appeared—in 1865, 1869, 1875, and 1882. He maintains that only in connection with Christianity can there be a study of the philosophy of history, as no other system makes evident the three great elements, God's providence, man's free will, and the powers of evil. In treating of the condition of the heathen world before Christ, he draws a striking comparison between Cicero and St. Augustine as representative men of their eras and systems of belief. He shows also the debasing effects of polytheism on human relations and institutions, and the redeeming effect of Christ's teaching and the work of the Church. The formation of the church at Rome is taken as a type of each particular church. Its development from Judaism, and its antagonism to the various forms of Greek philosophy, are fully treated. Next come the relations of the Church to the State, the discussion of which occupies the fourth volume. While recognizing civil government as a divinely-founded institution of the natural order, he insists on the essential superiority of the Church as belonging to the higher spiritual order. The independence of the latter is not merely ideal, but is shown to be an historic fact after the Council of Nice as well as before it. The whole work is eminently philosophical, displaying remarkable learning and profound study of the Fathers of the Church. It has been translated in part into German. Other works of Mr. Allies, of an autobiographical nature, have appeared—*Per Crucem ad Lucem* (1879), which indicates the controversies that disturbed his peace of mind before his entrance into the Catholic Church, and *A Life's Decision* (1880), which is a simple narrative of his conversion.

ALLIGATOR PEAR. This is the fruit of *Persea gratissima*, or *Laurus Persea* of authors. The tree is a native of the West Indies, and is sometimes cultivated in Florida. It is closely allied to the camphor and cinnamon, and, like them, possesses aromatic qualities. The fruit is as large as a good-sized pear, and the pulp around the single seed has a delicate rich flavor which finally becomes agreeable to those who do not at first care for it. (T. M.)

ALLINGHAM, Helen Paterson, an English artist, was born in 1848 near Burton-on-Trent. Her maiden name was Paterson. Her early studies were made at the school of design at Birmingham. Afterwards she studied at the Royal Academy in London, and also in Italy. Her first exhibition pictures, entitled Wait for Me and The Milkmaid, were shown at the Royal Academy in 1874. The next year she was elected an associate of the Society of Painters in Water-colors, and to the exhibition of the society of that year she sent a picture entitled Young Customers. To succeeding exhibitions she has contributed A Spring Day, The Old Men's Garden at Chelsea Hospital, The Robin's Song, The Bathing-place, The Brown Girl, Dangerous Ground, and May, and she has frequently made illustrations for *The Graphic* and other illustrated papers and magazines. Mrs. Allingham is an accomplished artist, who thoroughly well understands her own capabilities and seldom fails to achieve entirely pleasing results. (W. J. C., JR.)

ALLINGHAM, William, an Irish poet, born at or near Ballyshannon, county Donegal, about the year 1828. He was the son of an officer of the provincial bank. Just after he was twenty-one years of age he published a small volume of poems, which he dedicated to Leigh Hunt: it was well received, and he at once took rank among the true poets of the day. He was appointed to a place in the English custom-house, and in 1864 he received, in recognition of his merits as a writer, a literary pension. In 1855 he had issued his *Music-Master* and a volume entitled *Day and Night Songs*, and later a more pretentious work, *Laurence Bloomfield in Ireland, a Poem in Twelve Cantos*. He is chiefly known by a few graceful and humorous little poems, such as "Lovely Mary Donnelly," "The Fairies," "The Dirty Old Man," and "Robin Redbreast." In 1874 he became editor or manager of *Fraser's Magazine*. (H. C.)

ALLIOLI, Joseph Franz (1793–1873), a German Roman Catholic theologian, was born at Sulzbach, Aug. 10, 1793. He studied theology and philosophy at Munich, Amberg, and Landshut, in 1815 entered the episcopal seminary at Regensburg, and in the next year was ordained priest. He afterwards spent two years at Vienna, Bonn, and Paris in the study of the Oriental languages. In 1821 he began to teach at Landshut, and in 1823 was made professor of Bible study there. In 1826 he was transferred to the University of Munich, but in 1835 was obliged to resign his professorship on account of ill-health. He was then made capitular of the cathedral at Regensburg, and in 1838 became provost of the cathedral at Augsburg. He died there May 22, 1873. His most important work is a translation of the Bible into German, with notes (6 vols., Nuremberg, 1830–34; 4th ed., 3 vols., Regensburg, 1871). It follows the Vulgate, and is based on the previous translations of Braun (1788) and Feder (1808). It received the approbation of the pope, and is the standard German version for Catholics. Among Allioli's other publications were—*Biblische Alterthümer* (Landshut, 1825); *Leben Jesu* (Landshut, 1840); *Handbuch der Biblischen Alterthumskunde* (Landshut, 1841).

ALLODIUM, in law, an estate held by absolute ownership, without recognizing any superior to whom any duty is due on account thereof. The opposite term is *feudum*, which implies tenure or service due to the original possessor and grantor on condition of which the grant was made. England, at the time of the Norman Conquest, was divided into boc-land, corresponding in Saxon law to allodium, and folc-land, or land held by the people in common. In the year 1087, however, under the oath taken at the Council of Sarum (or Salisbury) by all the nobility and freemen, all the land in England became feudal, and was held mediately or immediately of the king as lord of the realm; though we should add that the more modern writers have denied that the introduction of feudalism dates from this council, which they claim merely shows that the system had then become established. In the United States land is essentially allodial; every owner of land has an absolute and unqualified dominion over it. Many technical terms and rules of the feudal law still remain, but the feudal relation which they imply never existed here. The etymology of "allodium" is much disputed. The most common derivations are: Saxon, *a* privative, and *lode*, a vassal (without vassalage); *a*, to, and *leod*, people (freely alienable); *odh*, property, and *al*, all (absolute property); and *an-lot* (property obtained by lot), which last is also the latest derivation. (J. M. G.)

See Vol. I. p. 516 Am. ed. (p. 587 Edin. ed.).

ALLON, Henry, D. D., an English Congregational minister and author, was born at Welton, Yorkshire, England, Oct. 13, 1818. He was educated for the ministry at Cheshunt College, Hertfordshire, and in Jan., 1844, was ordained assistant pastor of Union Chapel, Islington. On the death of Rev. Thomas Lewis in 1852, Mr. Allon became sole pastor of the congregation. Although constantly engaged in ministerial duties, he has been a frequent contributor to *Cassell's Biblical Educator*, the *Contemporary Review*, and other periodicals. In 1865 he became the editor of the *British Quarterly Review*, which he has since conducted with great ability as a representative of Nonconformist scholarship and ideas. He has been active in promoting church music in his denomination, and for this purpose compiled the *Congregational Psalmist*. He has also published a *Memoir of the Rev. J. Sherman* (1863), which has passed through three editions. He edited the sermons of Rev. Dr. Thomas Binney, with a critical and biographical preface. A volume of his own sermons was published in 1876 under the title *The Vision of God*, and has reached its third edition. In 1877 a new church was erected by his congregation in Compton Terrace, Islington, at a cost of £41,000. His eminence in his own denomination is shown by his being chosen chairman of the Congregational Union in 1864, and again in 1881. His merits have been recognized in other countries, as is shown by the honorary degree of D. D. conferred on him by Yale College.

ALLSPICE, Allspice Tree. Allspice is well known in the culinary art, and derives its name from its combining the aromas of several other spices. It is the unopened flower-bud of the *Eugenia Pimenta*, a plant of the *Myrtaceæ*, or Myrtle family. It is extensively cultivated for this purpose in the West Indies, where the trees are grown in groves known as "pimenta walks."

The Allspice tree of the United States is *Calycanthus floridus*, so named from the branches having a taste very similar to allspice. But its most common name is "Sweet-scented Shrub," deriving it from the sweet flowers, which have an odor resembling ripe strawberries. It is very common in country gardens, where the flowers are often gathered and placed in drawers with clothing, to which they impart a pleasant fragrance. The root has an odor of camphor. It is the type of a small natural order known as *Calycanthaceæ*, and is indeed closely allied to *Myrtaceæ*, to which the true Allspice belongs. It forms a bush about 8 feet high when mature, and is indigenous in the southern spurs of the Alleghany range. The first plant introduced and long cultivated in gardens happened to be comparatively unproductive, and increase from this original plant has perpetuated the character it receives in garden books of seldom producing seed; but since the plant has become common in gardens from the seed gathered in its native places, it is found there are some plants naturally more productive than others. Some yield full crops of seed annually. (T. M.)

See Vol. I. p. 519 Am. ed. (p. 590 Edin. ed.).

ALMANAC. No copy has been preserved of the first almanac printed in the American colonies, "an Almanac calculated for New England, by Mr. William Pierce, Mariner," published at Cambridge in 1639 by Stephen Day, who a year later published the famous *Bay Psalm-Book*. Almanacs were published at Cambridge annually thereafter with scarcely an intermission. In 1676, John Foster first published the *Boston Almanac*. Ten years later William Bradford of Philadelphia published the almanac known by his name, and commonly received as the earliest American almanac. It was edited by Daniel Leeds, and was a small book of 20 pages. At the sale of the Brinley Library in New York in March, 1882, a copy was sold for $555. Samuel Clough's *New England Almanac*, published at Boston, 1700–08, was another early publication. The *Astronomical Diary and Almanac* of Nathaniel Ames, published at Boston during a period of about sixty years, beginning with 1725, seems to have been the first work of this sort to attain wide popularity, its annual sale exceeding 50,000 copies. Other early almanacs were the *American Almanac*, begun at Philadelphia by Titan Leeds in 1726, the *Pennsylvania Almanac*, first published by T. Godfrey at Philadelphia three years later, and *Warne's Almanac*, printed at Williamsburg, Va., in 1731.

By far the most notable of these annuals, however, was that with which Franklin's name is so intimately associated. "In 1732," says Franklin, "I first published my almanac, under the name of Richard Saunders. It was continued by me about twenty-five years, and commonly called *Poor Richard's Almanac*. I endeavored to make it both entertaining and useful, and it accordingly came to be in such demand that I reaped considerable profit from it, vending annually near 10,000. And observing that it was generally read, scarce any neighborhood in the province being without it, I considered it as a proper vehicle for conveying instruction among the common people, who bought scarcely any other books. I therefore filled all the little spaces that occurred between the remarkable days in the calendar with proverbial sentences, chiefly such as inculcated industry and frugality as the means of procuring wealth, and thereby securing virtue, it being more difficult for a man in want to act always honestly; as, to use here one of those proverbs, 'It is hard for an empty sack to stand upright.' These proverbs, which contained the wisdom of many ages and nations, I assembled and formed into a connected discourse prefixed to the almanac of 1757 as the harangue of a wise old man to the people attending an auction. The bringing all these scattered counsels thus into a focus enabled them to make greater impression. The piece, being universally approved, was copied in all the newspapers of the American continent; reprinted in Britain to be stuck up in houses; two translations were made of it in France, and great numbers bought by the clergy and gentry to distribute gratis among their poor parishioners and tenants. In Pennsylvania, as it discouraged useless expensive foreign superfluities, some thought it had its share of influence in producing that growing plenty of money which was observable for several years after its publication." Jared Sparks, in his edition of Franklin's works, gives the advertisement of the first number, printed in the *Pennsylvania Gazette*, Dec. 19, 1732, as follows: "Just Published, for 1733, an Almanac, containing the Lunations, Eclipses, Planets' Motions and Aspects, Weather, Sun and Moon's Rising and Setting, High Water, etc., besides many pleasant and witty Verses, Jests, and Sayings; Author's Motive of Writing; Prediction of the Death of his Friend, Mr. Titan Leeds; Moon no Cuckold; Bachelor's Folly; Parson's Wine and Baker's Pudding; Short Visits; Kings and Bears; New Fashions; Game for Kisses; Katherine's Love; Different Sentiments; Signs of a Tempest; Death of a Fisherman; Conjugal Debate; Men and Melons; The Prodigal; Breakfast in Bed; Oyster Lawsuit, etc. By Richard Saunders, Philomath. Printed and sold by B. Franklin." Three editions of this almanac were printed before the end of January, 1733, and two editions were frequently required in later years, even after the great vogue of the publication had been ascertained. Sparks doubts whether a complete series of the almanac is now in existence: he was unable to find more than a third of the numbers. At the Brinley sale an uncut copy of the almanac for 1736 brought $54. This almanac, which was continued by others as *Poor Richard Improved* until 1786, is lauded by the French encyclopædist Larousse as the first popular publication of the kind that spoke the language of reason. Mr. Ainsworth R. Spofford, in his "Brief History of Almanacs," published in the *American Almanac* for 1878, remarks that "the generally worthless character which has been attributed to the English almanac of the last century must be modified as regards some of the American family almanacs." Mr. Spofford gives an interesting list of the more notable almanacs which have been published in long series in this country, among them being the following: *Father Abraham's Almanac*, by Abraham Weatherwise, Philadelphia, 1759–99; Nathanael Low's *Astronomical Diary or Almanac*, Boston, 1762–1827; Isaiah Thomas's *Massachusetts, Connecticut, Rhode Island, New Hampshire, and Vermont Almanac*, Worcester, Mass., and Boston, 1775–1822; *Poor Will's Almanac*, Philadelphia, 1770–1840, or later; the *Virginia Almanac*, Williamsburg and Richmond, 1751–1829, and later; the *South Carolina and Georgia Almanac*, Charleston, 1760–1800, and later; besides the following which have survived: R. B. Thomas's *Farmer's Almanac*, Boston, 1793; the *Massachusetts Register and Almanac*, Boston, 1767; Webster's *Calendar, or the Albany Almanac*, 1784; Bickerstaff's *Boston and New England Almanac*, 1768–1814, continued as Bickerstaff's *Rhode Island Almanac*, Providence; Dudley Leavitt's *New England Almanac*, Exeter and Concord, N. H., 1797; D. Robinson's *Maine Farmer's Almanac*, Hallowell, 1817; and Daboll's *New England Almanac*, New London, Conn., 1777. The *American Nautical Almanac* was founded by the late Admiral Charles Henry Davis in 1849, the first volume (for 1855) being published in 1853. It is still published annually, its present editor being Prof. Simon Newcomb. Peter Force's *National Calendar*, published at Washington from 1820 to 1836 (with a three years' interval, 1825–27), an official register of the Government, with useful information and abstracts of public documents, was the earliest number of the often-interrupted succession of year-books of the more ambitious sort. The *American Almanac and Repository of Useful Knowledge* was published from 1830 to 1861 at Cambridge and Boston, containing, besides its copious astronomical and meteorological information, a valuable collection of statistics, a chronicle of events, obituary notices, etc.; the *National Almanac and Annual Record*, published at Philadelphia by George W. Childs in 1863–64, was designed as a continuation of it. John Downes's *United States Almanac* was first published at Philadelphia in 1843, and was mainly composed of astronomical matter and tables: only three issues were printed. A mammoth volume was published at Hartford, Conn., by David N. Camp in 1869—*The American Year-Book and Annual Register*—but a second number was not reached. Mr. A. R. Spofford's *American Almanac*, publication of which was begun in 1878, is the most complete of contemporary American almanacs, and in the special field of political statistics has entirely superseded the almanacs printed by the great newspapers. The most notable of these, the *Tribune Almanac*, begun with the *Whig Almanac* issued by Horace Greeley in 1838, has borne its present name since 1855. The New York *World's* almanac was first issued in 1868, and discontinued after 1876. The New York *Herald's* almanac, which contained among other features, a list of heirs advertised for in America since 1835, was published from 1872 to 1878. Of greater importance, so far as the political history of the State of New York is concerned, are the Albany *Evening Journal's* almanac, first issued in 1857, and the Albany *Argus's* almanac, 1874. The almanac published by the New York *Star* has a wide local circulation. Before the New York *Evening Express* was incorporated with the *Evening Mail* it published a statistical almanac of great size. Of contemporary newspaper almanacs, those of the Philadelphia *Public Ledger*, first printed in 1870, and the Philadelphia *Times* (1876), are most worthy of mention. The New York *Clipper's* almanac is practically the sole representative of the sporting interest. According to Spofford, the original date of publication of the most important religious or denominational almanacs is as follows: The *Church Almanac* (Protestant Episcopal), 1830; *Catholic Almanac and Directory*, 1833; *Methodist Almanac*, 1834; *Universalist Register*, 1836; *Baptist Almanac*, 1842; *American Unitarian Register and Year-Book*, 1846; *Presbyterian Historical Almanac*, 1858; *Family Christian Almanac*, 1821. The Protestant Episcopal almanac is better known as *Whittaker's Churchman's Almanac*. The *Catholic Almanac* is properly *Sadlier's Catholic Directory, Almanac, and Ordo*. It was founded in 1833 at Baltimore as the *Metropolitan Almanac*, but its publication was discontinued at the beginning of the war. It was revived in 1863 by the Messrs. Sadlier, and is now published in New York and Montreal. The discontinuance of a large almanac and directory of French residents in the United States, first published by the *Messager Franco-Américain* at New York in 1877, leaves the French press unrepresented in this field. Of comic almanacs may be mentioned that issued by *Puck*. Vennor's *Weather Almanac*, the *Irish-American Almanac*, the *Farmer's Almanac* (American News Co., New York), and the *Catholic Family Annual* are also widely circulated. About one hundred almanacs may lay claim to a national circulation in the United States. Nor should mention be omitted of the almanacs prepared—literally by millions—by the dealers in patent medicines for gratuitous circulation in all parts of the world.

In France, as elsewhere, the almanac was among the earliest of printed books. Larousse and the Encyclopædists generally consider Michel de Nostradamus's almanac, first published in 1550, as the earliest publication of the kind, but (see Charles Nisard's *Histoire des Livres populaires, ou de la Littérature du Colportage*, 2 vols., Paris, D'Amyot, 1854) M. Brunet's catalogue begins with the *Grand Compost des Bergers*, printed at Paris in 1493. The most famous of Old-World almanacs is the *Almanach de Liége*. The earliest copy extant bears the date 1636, but there is nothing to indicate that the almanac was then published for the first time. That it was prepared by a canon of St. Bartholomew, Matthieu Lænsberg, or that Matthieu Lænsberg ever existed—his name is not found in the list of canons—has not been established satisfactorily, but tradition makes him a churchman and its author, and to this day the names of Lænsberg and Liége are potent charms wherewith to conjure the rural almanac-buyer. There are more than a dozen almanacs whose titles recall the sage or his dwelling-place, the most popular perhaps being the *Double liégeois* and *Triple liégeois*. In matter and make-up they are practically what they were in the seventeenth century, being printed on candle-paper with battered type and coarse woodcuts, while the predictions concerning the weather and mundane matters generally are as silly as they were at the first. Nevertheless, these almanacs enjoy an almost incredible vogue. Twice their prophets have made lucky hits. Madame Dubarry, annoyed and alarmed by the prediction of the *Almanach de Liége* that in April, 1774, "one of the most favored of women" would "play her last part," endeavored to secure the suppression of the book: in that month Louis XV. was attacked by his mortal malady, and she was obliged to leave the court. Again, in his predictions for 1830, "Matthieu Lænsberg" set down bloodshed and revolution for July—a hit not less palpable than that of the Italian prophet who in 1877 predicted that two great catafalques would be erected at Rome in January and February of the following year, when, indeed, Victor Emmanuel and Pius IX. passed away. Next to the Liége-Lænsberg almanac comes the *Messager Boiteux* of Strasburg and his brothers of Basle and Berne, but little inferior in age, ugliness, and stupidity.

The fact that the almanac was the only book which visited the homes of the masses of French peasants, laborers, and artisans indicated it from the morrow of the Revolution as the instrument best adapted to the use of the political propagandists. *L'Almanach du Père Gérard* enjoyed great popularity during the Revolutionary period. Napoleon took care that nothing unfavorable to the imperial régime was published in the almanacs, but under the monarchy of July, France was deluged with such publications as *L'Almanach de la France democratique*, *L'Almanach phalanstérien*, and *L'Almanach icarien*, while the Revolution of 1848 was fertile of democratic, republican, and socialistic year-books. Louis Napoleon instituted in Nov., 1852, the "commission d'examen des livres du colportage," and official sanction being needed ere almanacs and other publications of the sort could be distributed by peddlers and booksellers, the political almanac went out of circulation. The Third Republic is more liberal, as under it flourish impartially *L'Almanach républicain*, *L'Almanach royaliste*, *L'Almanach des Amis d'Henri V.*, and a dozen other publications avowedly political. Side by side with *L'Almanach du bon Catholique* circulates an atheistic almanac filled with studied indecencies and blasphemies. But the great mass of French almanacs—one firm in Paris is said to publish 300—are non-political. Many are of a practical sort, and contain, besides the calendar and the usual astronomical information, recipes, prescriptions, and counsels of a useful character, with not a little reading matter fairly selected. Many others are designed for amusement, and contain caricatures and light literary matter, prose and verse, their worst fault being a tendency to grossness, which in some cases is unrelieved by cleverness and becomes revolting. Almanacs devoted to songs, riddles, games, and puzzles form a notable feature of French popular literature; others instruct their readers in etiquette; still others are designed for the amusement of the little ones. Of the serious publications, *L'Almanach national*, founded in 1699 as *L'Almanach royal*, and styled

L'Almanach impérial under the Napoleonic régime, is the most important. With it may be mentioned *L'Almanach de France* and *L'Almanach du Commerce;* the latter is practically a commercial directory of Paris, and has been published since 1798. There have been no legitimate successors to such publications as *L'Almanach des Muses* (1764–1833), one of the most notable of the annual collections of fugitive poems which formed a characteristic feature of French literature two or three generations ago, and has a parallel in the German *Musenalmanach* or Grimod de la Reynière's *Almanach des Gourmands.*

Of continental almanacs, the well-known annual published in German and French at Gotha by Justus Perthes may be mentioned. A midsummer supplement, containing the diplomatic and consular appointments, has just (1882) been added to this publication, which dates from 1764, and was once suppressed by Napoleon for failing to recognize his imperial pretensions. The statistics of the *Gotha Almanac* are, however, to be received with caution, and its editing leaves much to be desired in so far as the non-royal families are concerned.

Mention should be made of the *Statesman's Year-Book,* founded at London in 1864, probably the best English annual that can be named, though its non-statistical departments are at times disfigured by blunders almost phenomenal. Of popular publications *Whitaker's Almanack* is the most comprehensive, and the *Financial Reform Almanac* is a perfect mine of statistical information. The prophetic almanacs, such as "Zadkiel's" and "Raphael's," have an immense and evidently a growing circulation. While it must be admitted that some of these almanacs give their readers some value for their money in the shape of astronomical information, business memoranda, popular tables, etc., nothing can be more absurd and impudent than their astrological predictions, "voices of the stars," and "symbolical hieroglyphics," except perhaps the explanations which follow in due course to exalt success or excuse failure. Where some hundreds of predictions are made annually, during a long period of years, of events which must surely happen some time or other—wars, famines, earthquakes, pestilences, fires, shipwrecks, the death of sovereigns, and the disgrace of statesmen—it is inevitable that from time to time notable hits must be made. The tendency of mankind is to notice such hits and ignore all the misses, and the "prophets" and "seers" do not fail to take advantage of this fact, while their readers, apparently, are blind to the colossal impudence with which patent failures are explained where they cannot be ignored. That the demand for such publications should increase with the advance of popular education is a phenomenon more singular than satisfactory.

Some interesting though desultory notes upon almanacs and almanac-makers will be found in Chambers's *Book of Days.* Mr. Abel Haywood, Jr., of Manchester, has made an entertaining study of English almanacs during the second Stuart and revolutionary periods. From the statement made by William Andrews in one of the almanacs quoted by Mr. Heywood, it seems that the authorities in England, as in France, were sensitive upon the subject of astrological predictions, the almanac-maker being warned by his "superiors" to "forbear" making them. So popular were jests at the expense of the Society of Friends that a *Yea-and-Nay Almanac* was published by the Company of Stationers. Among the curious almanacs of the period was the *Weaver's Almanac,* which contained information concerning nearly all the trades except that of the weaver. While the almanacs of two centuries ago show a gradual decay of the superstitions to be found in the earlier calendars, they also indicate a popular knowledge of, a popular interest in, certain natural phenomena which are now passing away. Tables showing how to tell time by sundials at night or by the position of the stars, such as were common in the Stuart almanacs, would now be received with surprise. Their disappearance illustrates curiously the truth of Emerson's saying concerning the civilized man who has got a watch, but has lost the skill to tell the hour by the sun. (G. T. L.)

ALMA-TADEMA, LAURENCE, an artist of Netherlandish birth, who has been domiciled in England for a number of years, and who is usually classed among the English painters, was born at Dronryp, West Friesland, on June 8, 1836. He was carefully educated at Leeuwarden, and in 1852 entered the Academy of Fine Arts at Antwerp. He belongs to an ancient and wealthy family, and it was originally the intention of his parents to educate him for a physician. While at the Leeuwarden school he became greatly interested in Greek and Roman antiquities, and at the same time developed such strong artistic inclinations that, after much persuasion, his parents were induced to enter him at the Antwerp Academy as a pupil of Baron Leys. That master encouraged his genius for research, habits of very careful workmanship, and the development of an original style; for, although Alma-Tadema's manner to some extent suggests that of Baron Leys, it is essentially his own, and is characterized by refinements superior to those of his preceptor. The first picture of Alma-Tadema which attracted general attention to him as an artist of unusual culture and gifts was The Education of the Grandchildren of Clothilde, exhibited in 1863. This was followed in quick succession by a series of paintings representing chiefly Greek, Roman, and Egyptian subjects, some of them historical, but the majority dealing either with idyllic themes or scenes of familiar life. Alma-Tadema's historical pictures—as, for example, A Roman Emperor, painted in 1871, which represents the prætorians discovering Claudius in his hiding-place after the assassination of Caligula, and which is one of the artist's most successful attempts to deal with an important historical subject—are not without great merit; but he lacks the dramatic power necessary for the adequate portrayal of illustrative historical episodes. On the other hand, some of his idyllic pictures—for example, Reproaches (1872) and Autumn (1874)—are very charming. His best successes, however, have been achieved in the delineation of scenes of familiar life. To the composition of this class of pictures Alma-Tadema has brought great antiquarian learning and a refined technical skill. He has endeavored to conceive how certain typical Greeks or Romans would have looked and acted under certain typical every-day circumstances, and the result is a series of pictures which impress the beholder as being truthful as well as spirited reproductions of the traits of the most imposing of the antique civilizations. The elaborate composition entitled The Vintage, painted in 1870, the beautiful engraving from which by Blanchard has enjoyed a great popularity, is a favorable example of the class of works upon which Alma-Tadema's reputation rests. Among his other notable representations of Greek, Roman, and Egyptian life may be mentioned, How they Amused themselves in Egypt Three Thousand Years Ago, 1863; Catullus at Lesbia's, 1865; The Soldier of Marathon, 1865; Entrance to a Roman Theatre, 1866; A Roman Dance, 1866; The Mummy, 1867; Tarquinius Superbus, 1867; The Siesta, 1868; Phidias and the Elgin Marbles, 1868; Flower Market, 1868; A Roman Amateur, 1868; Pyrrhic Dance, 1869; The Convalescent, 1869; A Wine-Shop, 1869; A Juggler, 1870; Un Fête Intime, 1871; A Greek Pottery, 1871; The Mummy (Roman period), 1872; The Improvisator, 1872; Death of the First-born, 1872; Greek Wine, 1872; The Dinner, 1873; Fishing, 1873; Joseph Overseer of Pharaoh's Granaries, 1874; A Sculptor's Gallery, 1874; A Picture-Gallery, 1874; Good Friends, 1874; An Audience at Agrippa's, 1876; After the Dance, 1876; Cleopatra, 1876; The Seasons (four pictures), 1877; A Love Missile, 1878; and Sappho, 1880. There is a certain amount of pedantry in all of these pictures, and in many of them the accessories have an undue importance. In the main, however, the artist has been successful in achieving the results at which he obviously aimed, and the interest is centred, where it properly belongs, in the human beings who are delineated upon the canvas. The moral purity of Alma-Tadema's works is worthy of particular notice, especially in view of the unclean suggestions which certain well-known French artists who affect the same class of subjects appear to find it impossible to avoid, although its avoidance may be easy and is demanded by obvious proprieties. Even in the single study of the nude which he has put on exhibition—A Sculptor's Model, painted in 1878—he has skilfully contrived to avoid giving just cause of offence. This picture, it is understood, was executed in answer to a challenge of his ability to worthily paint the undraped figure. From a technical standpoint it is certainly not beyond criticism, but it is nevertheless a very beautiful and very characteristic work.

In 1870, Alma-Tadema took up his residence permanently in London, having lost his first wife, the Countess Pauline Demoulin, the year before. In 1870 he also married Theresa Epp, an English lady, the youngest daughter of Dr. George N. Epp. This lady is an accomplished artist, and has repeatedly exhibited with popular success. In 1873, Alma-Tadema became a British subject, and in 1876 he was elected an associate of the Royal Academy. He is a member of the Academy of Fine Arts of Amsterdam, of the Royal Academy of Munich, of the Royal Academy of Berlin, and of the English Society of Painters in Water-colors. He was made a knight of the order of Leopold (Belgium) in 1866, a knight of the Dutch Lion in 1868, a knight of the order of St. Michael (Bavaria) in 1869, and was decorated with the cross of the French Legion of Honor in 1873. He has also received a number of medals for works contributed to international and other important exhibitions. Alma-Tadema's house in London, to a large extent planned and decorated by himself, is celebrated as one of the most beautiful of the many beautiful residences of artists in the British capital. (W. J. C., JR.)

See Vol. I. p. 523 Am. ed. (p. 594 Edin. ed.).

ALMOND. The almond is now among the important products of the United States. Though the consumption is enormous and the population has increased, the value of the importations declines from year to year, when an average of a few years is taken, in consequence of our increased product. While, for instance, during the fiscal year ending in 1856 the value of the importations was $250,000, that of 1876, twenty years later, was but $180,279, and this was higher than the figures of many years before. In 1879 the total was but $161,000. The culture has never been very successful in the Atlantic portions of the United States, though fair results are reached in Florida. The flowers are more sensitive to warmth than even those of the peach, and a few warm winter days forward them, only to be destroyed by the spring frosts. The trees bear in Pennsylvania more certainly than in Georgia on this account, as the winter warmth of the latter State prematurely advances the blossoms. In these States, however, the tree partakes of the short-lived character of the peach, and cannot be made profitable. California is the great almond-producing State. The climate and soil are there much more like those of its European home, for it delights in deep sandy earth and a rather dry climate. In Italy the trees commence to bear when about four years old, and are at their best at from fifteen to thirty, not failing remarkably till they reach about sixty years. They seem to retain this character in California, where there are orchards which were planted in 1852, and are still productive. The yield in California is about 20 pounds to the tree, and the income about $500 per acre. The almond will grow when grafted on the plum, the peach, or seedlings of its own kind; but the two former are never employed by practical almond-growers. Nor is the bitter almond grafted on the sweet, or the sweet on the bitter, if preference can be had, but each is worked on seedlings of its own kind.

The early history of the almond is shrouded in obscurity. Theophrastus says it was in his day the only tree in Greece which produced flowers before leaves. In Cato's time it was not grown in Italy, but as a sort of imported luxury was known as the "Greek nut." It was not introduced into England till the reign of Henry VIII., and has only there been grown as an object of ornament. The peach is believed to have been derived from the almond, but no instance of such a departure seems to have been recorded as an actual occurrence. The hard-shelled almond, however, has a stone intermediate in many respects between the two. The almond is a favorite after-dinner nut. (T. M.)

See Vol. I. p. 526 Am. ed. (p. 597 Edin. ed.).

ALPACA. In 1865, and for ten years thereafter, considerable attention was shown to the alpaca industry in this country. Factories were established at Holyoke and Lawrence, Mass., for the manufacture of dress goods, linings, yarns, etc. The degree of success attained in the manufacture was very commendable, and the fabrics made found ready and profitable sale. About the same time attention was turned to the growth here of the raw material. In 1875 a small flock of alpacas was brought from Peru and placed in the Alleghanies in North-western Maryland. Soon after the demand for goods of this material rapidly declined, being superseded by the demands of fashion for worsted and other classes of lustreless goods, so that breeders and growers, finding there was but little inquiry for the fabrics, very naturally lost their interest in the raw material. The location of the animals in Maryland proving not favorable, further attempt to raise the raw material in this country was abandoned, and, so far as is known, of these importations of the alpacas made to the United States there is not now a single specimen surviving. This much as to the animal has been very clearly proved by the experiments: that the only locality in the Union where the alpaca can thrive is on the highest ranges of the Rocky Mountains, with atmospheric conditions like those of Peru and Bolivia. As the country adjacent to these ranges is now being rapidly settled, the attention of stockmen may be turned to the husbandry anew. It is only under such location and climatic conditions that there is any hope of success for the acclimation of the alpaca.

At the present time (1883) there is a renewed interest in and call for fabrics made from alpaca hair. This fibre is very enduring in character and wear, and for certain uses, as lining, braids, etc., is very desirable. Were lustre goods in demand, the dress fabrics made from it would, from their wearing qualities, at once assume their former place in the market. Some new combinations and patterns that have lately come into use in silk manufactures would show to great advantage in alpaca fabrics. At Bradford and Saltaire in England these new styles are being made to answer the recent demand for a return to the use of lustre goods. While the source of supply of raw material to the American manufacturer can only be found, for a long period, in South America, yet the progress made up to 1877 in the alpaca industry in this country will warrant a return to it the moment it is assured the demand for the fabrics is likely to be considerable and permanent; and as to the growth of the raw material here, there is, in view of the rapid settlement of Wyoming, Nevada, and other like districts suitable for the alpaca husbandry, no more improbability of its future success and permanence there than there was seventy-five years ago that the finest merino-sheep husbandry of the world would be in the United States of America.

ALPENA, the county-seat of Alpena co., Mich., is on Thunder Bay, at the mouth of Thunder Bay River, 200 miles north of Detroit and 120 miles north of Bay City. From it steamboats run daily to both of these cities. It has a bridge across Thunder Bay River, an opera-house, court-house, ten hotels, two banks, one daily and three weekly newspapers, eight churches, and fifteen schools. It has good water-works, telephones, and is lighted with electric light. It has two foundries, eighteen saw-mills, three sash-and-blind factories, and carries on a large trade in lumber. It was settled in 1860, but had previously been known as a hunting and fishing resort. It was incorporated as a city in 1871, and is inhabited by a good class of people, mostly of American birth. Its property is valued at $2,200,000; its public debt is $2000, and its yearly expenses $40,000. Population, 6153.

ALTAMAHA, a river of Georgia, formed by the union of the Ocmulgee and Oconee, which unite near the west extremity of Tatnall county. It flows southeastward through a level and sandy plain partly covered with pine forests, and enters the Atlantic Ocean 12 miles below Darien. It is about 150 miles long, and is navigable for vessels of 30 tons through its whole extent.

ALTAZIMUTH, called also an altitude-and-azimuth instrument, a telescope mounted with its two axes, the one parallel with the zenith and nadir, the other with the horizon. As its name indicates, its motions are in altitude and azimuth, while those of the equatorial are in declination and right ascension.

With meridian telescopes (the transit instrument, the mural circle, the meridian circle, etc.) objects can be observed only while passing the meridian, and such observations are called meridianal observations; while with the altazimuth, and also with the equatorial, objects anywhere on the celestial vault, if above the horizon, can be observed, and such observations are called *extra-meridianal*.

The altazimuth has two motions—one round a perpendicular axis, and of course parallel to the horizon; the other at a right angle to it, or in altitude. When the instrument is levelled and the zero of the azimuth circle is placed in the meridian, and an object brought to the centre of the field of view of the telescope, its azimuth (angular distance east or west of the meridian) can be read off from the azimuth circle, and its altitude (distance above the horizon) from the altitude circle, thus giving its position with considerable accuracy. An object's altitude when in the meridian is called its meridian altitude. This instrument is not extensively used in observatories, but has been superseded by the equatorial, which is not only more firmly mounted and easier to use, but also attended with less labor in the reductions of the observations. The altazimuth, under the name theodolite, made of small size in order to be portable, is much used for geodetic, engineering, and surveying purposes. When thus used it becomes necessary that it have a terrestrial eye-piece containing four lenses, as objects seen through a celestial eye-piece having but two are inverted.

Small, cheap telescopes are always mounted altazimuthly for making general observations where exactness and the determination of positions are not desired. (L. S.)

ALTHÆA, called in European literature "Althæa frutex," and occasionally "Rose of Sharon," is the *Hibiscus Syriacus* of botanists, and a native of Syria, whence its specific name. It thrives very well in the warmer and drier parts of Europe, where it is much esteemed. It is possible that it may be the rose of Sharon referred to in Solomon's Song, as it has been a popular plant in Eastern countries for many ages, though some take the Sharon plant to be the poet's rose. In America it is one of the most frequent ornaments of gardens. It blooms when but a bush, but is in perfection when it reaches a height of 15 or 20 feet, when it forms a dense round head covered with hundreds of bright, cup-shaped flowers in the summer season. There are a great number of varieties raised by florists. It is an excellent city flower, thriving amidst smoke and dust which would be fatal to many others. It is often used for hedges or screens, and Thunberg says it is popular for this purpose in Japan also, where it has been introduced to culture under the name of "Mukinge." It is very easily raised from seeds, which it produces freely in America, or from cuttings. (T. M.)

ALTHING, the parliament of the Icelandic republic. About sixty years after the first settlement the inhabitants of Iceland organized themselves into a republic and gave the whole island one constitution. The first want was a man to frame a code of laws; the second was a seat of congress. Ulfljot, a man sixty years old, was chosen to be the Lycurgus of the Icelandic republicans, and he spent three years in Norway to fit himself for this important task. While Ulfljot was absent the chiefs of Iceland appointed Grim Goatshoe—so called from his skill as a cragsman—to walk throughout the whole island and find the fittest place for the annual congress of the commonwealth to meet; and it was he who selected the famous rock-surrounded plain, Thingvols. Thus, while Ulfljot did the head-work, Grim Goatshoe may be said to have done the foot-work, of this scheme; and in the year 930 the first Althing met and solemnly adopted Ulfljot's code as the law of all Iceland. The regulations of the Althing were later modified by Thord Geller and Njál. It met once a year, in the month of June. Iceland was divided by Ulfljot's law into four districts named after the four points of the compass, and each district was required to send twelve men as representatives to the Althing, which was presided over by the so-called "speaker of laws." In the Althing all authority was vested, both the legislative and judicial. When Iceland was united with Norway in 1263, the Althing lost its legislative authority, but retained its judicial power, and continued to meet until the year 1800, when it was abolished. At the instance of King Christian VIII. it was reorganized Mar. 8, 1843, as a parliament to consider Icelandic local affairs for action in Copenhagen, and since then it has met every other year in Reykjavik until 1874, when its powers were materially increased and modified. Ulfljot's laws guaranteed liberty of conscience in religious matters.

ALTMEYER, Jean Jacques, D. C. L. (1804–1877), a Belgian historian, was born at Luxemburg, Jan. 24, 1804. He was educated at the athenæum of his native city and the University of Louvain. In 1831 he obtained, after examination, the degree of Ph. D., and in the next year that of D. C. L. In the mean time he had been appointed professor of rhetoric in the college at Ypres, where he published a *Manual of Universal History* that attracted attention. In 1834, when the Free University was established at Brussels, he was called to take charge of the department of history in that institution. In 1836 he prepared his *Introduction to the Philosophical Study of the History of Mankind*, and in the next year his *Outlines of Ancient History*. In 1837 a commercial and industrial school was established at Brussels, and Dr. Altmeyer was placed in charge of the department of political economy and commercial law, and continued in this position after the school was annexed to the Royal Athenæum. During a journey in the north of Europe, undertaken in 1840 under the auspices of the Belgian Government for the sake of historical researches, Christian VIII., king of Denmark, caused a gold medal to be struck in his honor. After his return Dr. Altmeyer published a valuable work on *The Diplomatic and Commercial Relations of the Netherlands with the North of Europe in the Sixteenth Century*. For forty years he labored among the archives of Belgium with the hope of publishing an exhaustive work on *The Netherlands in the Sixteenth Century*. Five volumes only had appeared when a severe disease interrupted his toil and prevented the completion of his task. After his death the Government obtained possession of his manuscripts, and an additional volume will probably soon appear. Besides his other duties he was for a time rector of the university at Brussels and member of the provincial council of Brabant. King Leopold I. made him a chevalier of his order in 1852. He died at Brussels, Sept. 15, 1877. He published numerous articles in the Belgian reviews—*Trésor National*, *Les Belges Illustres*, *Le Panthéon National*. Among his other works the most important are a

Course of Philosophy of History (1840), *Margaret of Austria, her Life, Policy, and Court* (1840), *Margaret of Austria and Christian II.* (1842), *Summary of Modern History* (1842), *Journey among the Hanseatic Towns and in Denmark* (1842), *Sketch of the History of Brabant* (1847), *The Right of Asylum in Brabant* (1848), *The Sea-Beggars and the Capture of Brille* (1863), *Campaigns of Louis XIV. in Belgium* (1864).

ALUCONIDÆ, a family of owls of the sub-order *Striges*. It is commonly called *Strigidæ*, but the fact that the type of the genus *Strix* falls in another family requires the name of the present family to be derived from *Aluco*. This is the genus of the barn-owls (*Aluco flammeus*, etc., and *Phodilus badius*), remarkably distinguished from ordinary owls (*Strigidæ*) in having the sternum entire behind, and the furculum ankylosed with the sternal keel. The facial disc is highly developed, and rather angular than circular; the external ear-parts are very large. The middle claw is pectinated, as in *Caprimulgidæ*; and these completely nocturnal raptorial birds would appear to have no little affinity with the nocturnal fissirostral birds through the family *Steatornithidæ* and some members of the *Caprimulgidæ* themselves. (E. C.)

ALUMINIUM. The combination of properties possessed by this metal is such as at once attracts the notice of chemists and practical men, suggesting most important applications in the useful arts. It has a clear white color and takes a good polish. It is very malleable and ductile. When cast it has about the hardness of silver, while the hammered metal about corresponds to soft iron in this respect. Its tenacity equals that of copper. It possesses a most remarkable resonance, resembling that of flint glass, and indeed at times too penetrating to make it entirely desirable as a substitute for bell-metal. While thus comparable to silver in many characters, its specific gravity is but 2·57 for the fused metal and 2·67 for the hammered. When in the compact state it tarnishes very slightly in either moist or dry air, although fine aluminium foil will burn in oxygen with great brilliancy. While not attacked by nitric acid or concentrated sulphuric acid, it is readily dissolved by hydrochloric acid and by alkalies in solution.

See Vol. II. p. 569 Am. ed. (p. 647 Edin. ed.).

The metal has been used for various small articles of ornament and luxury, such as call-bells, etc., but its chief use has been by the opticians in the manufacture of cases for opera-glasses, spy-glasses, and similar optical apparatus, for which its lightness and compactness give it special adaptation. Napoleon III. wished to use large plates of the metal instead of iron in the plating of war-vessels, where its weight (one-third that of iron) would have made a notable difference, but the experiments made under his direction by the French chemist Deville did not answer expectations. The first difficulty was the seeming impossibility of soldering it. But finally, Ph. Mourey discovered several alloys which serve admirably as solders for it. The first of these, used for smaller ornamental articles, consists of zinc 80 parts, copper 8 parts, and aluminium 12 parts; and the second, used for larger articles, consists of zinc 90 parts, copper 4 parts, and aluminium 6 parts. The metal as at present brought into commerce is not chemically pure, but contains from 5 to 12 per cent. of other metals, as will be seen by the following analyses:

Analyst.	Aluminium.	Silicon.	Iron.	Copper.	Lead.
Salvétat..........	88·35	2·87	2·40	6·38	trace.
Dumas............	92·5	0·7	6·8		
Sauerwein.......	97·2	0·25	2·5	...	trace.

At the present time the metal is chiefly used in the formation of alloys. Its alloys with copper possess the greatest interest. The addition of 1 per cent. only of aluminium to copper is said to increase notably the tenacity of the latter, to facilitate its fusion, and to give it the property of filling out the mould perfectly, yielding at the same time a compact casting free from air-bubbles. The copper so alloyed is made harder, without losing its malleability, and combines in itself the most valuable properties of both bronze and brass. The true aluminium bronzes, however, contain from 5 to 10 per cent. of aluminium, combined with from 90 to 95 per cent. of copper. This alloy takes a fine polish, yields perfect castings, and is very malleable. Aluminium bronze can readily be engraved, is easily rolled to sheet metal, and offers a greater resistance to atmospheric influences than bronze, brass, silver, cast iron, or steel. Its tensile strength is 65,778 pounds per square inch of surface, while the average of cast steel is 81,821 pounds and of gun-metal 36,289 pounds per square inch. These notable properties make aluminium bronze available for many purposes. For physical, geodetic, and astronomical instruments it is much to be preferred to any other metal. For journal- and axle-bearings in machinery it is also especially suited, because of the perfection of the castings and its hardness and strength. It has also been used instead of gun-metal in the manufacture of cannon, and has shown excellent results in this connection, but its high price (five times that of ordinary bronze) precludes extended use in this way. It is extensively used in the manufacture of cheap jewelry under the names of oroid, Collins's metal, etc., its beautiful golden color and excellent wearing qualities adapting it exceptionally well for such uses.

The aluminium used in the arts at present is chiefly made in France, a small additional quantity being made in England. The crude material in this manufacture is usually bauxite, a hydrated oxide. The available alumina or anhydrous oxide of the metal averages 50 per cent. in this ore.

The following is a brief outline of the present method of manufacture, as described by Prof. A. Wurtz: The powdered bauxite is mixed with soda, and this mixture, when heated in a reverberatory furnace, yields an aluminate of soda. This is extracted with water and decomposed with carbonic acid gas, yielding carbonate of soda and finely precipitated alumina as a white powder. This, when dry, is converted into the double chloride of sodium and aluminium by heating a mixture of it with common salt and coal in a current of chlorine gas. The double chloride so gotten is then reduced to aluminium by the action of metallic sodium, cryolite (a native fluoride of sodium and aluminium) having been added as a flux. The proportions used are—100 parts of the double chloride, 35 parts of sodium, and 40 parts of cryolite, and the yield is 10 parts of aluminium. The reduced metal which collects at the bottom of the mixture is then cast into ingots in iron moulds. This process is that followed at Salindres, near Alais, France, where the entire French manufacture of it has been concentrated. As 10 kilogrammes of the double chloride, costing 25 francs, and 3·5 kilogrammes of sodium, costing 39 francs, are necessary for the production of 1 kilogramme of aluminium, the metal must of necessity be expensive, its cost of production being at present about 80 francs per kilogramme and its selling price 100 francs per kilogramme, or nearly $10 per pound. Under these circumstances it is not strange that attempts should be made to replace the expensive sodium used in its manufacture by some cheaper metal. A number of methods have been proposed, and tried upon a small scale with greater or less success, but the only one that has been tried upon a sufficiently large scale to give results of any value is that in which the metal zinc is made to take the place of sodium. In this process the double chloride of aluminium and sodium is brought to fusion and the granulated zinc added. It fuses rapidly, and chloride of zinc forms as metallic aluminium is liberated. This aluminium alloys, however, with the excess of metallic zinc, and an aluminium-zinc alloy is the result of the operation, even at a red heat the amount of metal liberated being only sufficient to yield an alloy of equal parts of zinc and aluminium. This alloy must be fused with a fresh portion of the double chloride of aluminium and sodium, when an alloy can be gotten which contains only a small percentage of zinc. This alloy heated to a white heat loses all its zinc, and pure aluminium remains. The great objection to the process is the necessity of several repetitions and the extremely high temperature necessary to drive off all the zinc. It has never, therefore, come actively into use as a working process.

Mr. James Webster, of the Crown Metal Company of Birmingham, after many experiments has discovered a method of making alumina at one-tenth of the former cost. By burning alum and pitch in a calcining furnace he produces a gray cinder resembling the refuse of an engine-fire. By further processes this is converted into something which contains almost 90 per cent. of alumina, while the by-products are of almost sufficient value to defray the cost of working. The alumina is gotten as a gray powder, which is finer in texture than precipitated alumina and is almost free from the presence of silica. The Crown Metal Company now manufactures a ton of the fine alumina a week, while the former process required six months. The cheapening of the alumina which goes to the formation of the double chloride of aluminium and sodium according to present processes may have some little effect upon the price of the metal, but a cheapening of metallic sodium or a replacement of it by a cheaper metal like zinc would go much further towards making cheap aluminium.

Besides the specific statements above quoted, various less authenticated claims have recently been made for the discovery of new processes of preparing metallic aluminium. Thus, *Nature* of Dec. 21, 1882, states that a Mr. Morris of Uddingston, Scotland, has taken out a patent for making aluminium by heating an intimate mixture of alumina and charcoal in a current of carbonic acid gas. The metal is purified from carbon and alumina by fusion. We doubt whether this method will prove successful. It has often been tried before, but never with favorable results.

(S. P. S.)

ALVAREZ, Juan (1780?–1863), a Mexican general, was born about 1780 in the state of Guerrero, of an Indian family. By his courage and activity he obtained the surname of the "Panther of the South," and established a feudal sovereignty in the southern provinces. Yet he retained to a considerable extent the primitive habits and dress of the Indians by whom he was surrounded. In 1854, when Santa Anna attempted to establish a dictatorship, Alvarez rose in insurrection and published a plan of constitutional government called the "Plan of Ayutla." Other leaders followed his example, and Santa Anna, being defeated in the decisive battle of Saltillo, July 12, 1855, was obliged to fly from the country. In September a provisional government was organized with Alvarez at the head, and in October a national convention at Cuernavaca elected him president. He organized a national guard and summoned an assembly to meet in Mexico, Feb. 14, 1856. For some time he hesitated to depart to the capital, having a superstitious fear that he would perish there. He entered it, however, Nov. 15, 1855, surrounded by an Indian body-guard. His bold decree of Nov. 24 abolished the excessive privileges of the army and the clergy. This was his only important act; within a month, tired of the restraints and the cares of the presidency, he resigned his power into the hands of Comonfort, who had been his minister of war. With a large amount of arms and ammunition, as well as money, he returned to Acapulco, the capital of his state, where he resumed his former mode of life. When Comonfort was driven out in 1858, Alvarez resisted his successor and gave his support to Juarez. He died at Acapulco in 1863.

ALZOG, Johann Baptist (1808–1878), a German Roman Catholic church historian, was born in Ohlau, in Silesia, June 29, 1808. He studied at Breslau and Bonn, and was ordained priest in 1834. In the next year he was appointed professor of church history and exegesis in the theological seminary at Posen. In 1845 he was made capitular of the cathedral, and professor and director of the seminary, at Hildesheim. In 1853 he became professor in the University of Freiburg, and died there March 1, 1878. His chief work is his *Universalgeschichte der Christlichen Kirche* (Mayence, 1840), which has reached its tenth edition and has been translated into all the principal languages of modern Europe. The work is scholarly, philosophical, fair in treating vexed questions, and free from exaggerations. The American edition, translated by Rev. F. J. Pabisch and Rev. T. S. Byrne (3 vols., Cincinnati, 1876), differs considerably from the original work. Alzog also prepared a briefer treatise on the same subject, *Grundriss der Kirchengeschichte* (Mayence, 1868), and another on early Christian literature, *Handbuch der Patrologie* (Freiburg, 3d ed. 1876).

AMARI, Michele, an Italian author, politician, and Orientalist, was born at Palermo, Sicily, July 7, 1806. In 1822, when he had just completed his studies and secured a place under the Government, his father was tried and executed for conspiracy, and the support of the family devolved upon him. He devoted himself to investigation of the history of Sicily, and published as his first work *The Foundation of the Norman Kingdom in Sicily* (1834). He also fell under the suspicion of the authorities, and was ordered to leave his home and reside under *surveillance* at Naples, which he did for four years. He then returned to Palermo, where in 1842 he published his most popular work, *The War of the Sicilian Vespers* ("Guerra del Vespro Siciliano," 8th ed., Florence, 1876). This book was at first suppressed by the Government, and the author fled to Paris, where he studied Arabic and wrote a *History of the Moslems in Sicily*. During the Revolution of 1848 he was recalled to Sicily, and on his arrival in Palermo was made vice-president of the war committee, a member of the assembly, and minister of finance. Soon after he was sent on a special mission to the Governments of France and England. In 1849, while in Paris, he published a pamphlet entitled *Sicily and the Bourbons*, the object of which was to show that the rule of the king of Naples was incompatible with popular rights. He returned to Palermo when hostilities recommenced, but when Sicily was again subdued he went back to Paris. In 1860 he was recalled to Palermo, and took an active part in Italian affairs: in 1861 he was appointed senator by Victor Emmanuel, and joined Cavour in the Government. First appointed president of the lieutenancy of Sicily and charged with the finances, he was afterwards made governor of Modena, and in 1862 Italian minister of public instruction, which position he held till Sept., 1864. On his return to Italy he had been made professor of Arabic in the University of Pisa, and in 1861 he was transferred to the University of Florence. As fruits of his studies in Arabic he wrote numerous articles on that language and its literature in the *Revue Archéologique* and the *Journal Asiatique*. He also published the Arabic documents in the Florentine archives, with a translation and an historical introduction. Another important publication is the *Biblioteca Arabo-Sicula* in Italian (Turin, 1880–81), which is intended to form a continuation of Muratori's celebrated work. The Arabic texts had already been published at the expense of the Oriental Society of Germany (Leipsic, 1857–75). In 1878, Prof. Amari presided at the third international congress of Orientalists at Florence, and in 1882, on the occasion of the six hundredth anniversary of the Sicilian Vespers (March 31), he published a popular account of that event. Besides the works already mentioned, he translated into Italian the *Solwân* of Ibn Dhafer, and revised the English version, which appeared at the same time under the name *Solwân, or the Waters of Comfort* (London, 1852). He has translated into Italian blank verse Sir Walter Scott's *Marmion*, while his own *History of the Sicilian Vespers* has been translated into English by Lord Ellesmere. Prof. Amari is a member of many learned societies in Italy and in other parts of Europe, and has received numerous testimonials to his high rank as an Orientalist. (H. C.)

AMARYLLIS. See Atamasco Lily.

AMBIGUITY, in law, duplicity or uncertainty of meaning in a written instrument. Ambiguities are either latent or patent.

A latent ambiguity is one which does not appear upon the face of the instrument, but which arises out of some collateral circumstance or extrinsic matter. Thus, where a testator devised his manor of Dale, and upon his death it appeared that he owned two manors, one North Dale and the other South Dale, it was held that the will contained a latent ambiguity.

A patent ambiguity is one which appears on the face of the instrument, and which renders the expression thereof so defective that the court is unable to ascertain the intention of the parties executing it.

Latent ambiguities may be explained by parol evidence, but patent ambiguities cannot be so explained, and as far as they extend accordingly render the instrument containing them inoperative. (L. L., JR.)

AMBOY, a city of Lee co., Ill., is on the head-waters of the Green River, 82 miles west of Chicago, on the Illinois Central Railroad and on the Rock Falls branch of the Chicago, Burlington, and Quincy Railroad. It has two hotels, two weekly newspapers, four public-school buildings, eight churches, a fine public hall, and a park; three flouring-mills, three grain-elevators, a brick-and-tile factory, and two large butter-and-cheese factories. It also contains railroad machine-shops. It was laid out in 1854, and obtained a city charter in 1857. The surrounding country is well adapted to agriculture and stock-raising. Population, 2448.

See Vol. I. p. 587 Am. ed. (p. 669 Edin ed.).

AMERICA. No change has taken place in the political structure of the Western continent within the past decade, except such as has arisen from alterations in national boundary-lines.

In British America the business of confederation has advanced no further. Newfoundland still lingers outside the Dominion of Canada. The work of consolidation and of removing local dissatisfaction has made progress. The discontent which led to threats of secession in British Columbia has been appeased by the definitive arrangements for the construction of the Canadian Pacific Railroad; that in Prince Edward Island, by the abolition of the British system of land-tenure. But the work of consolidation is retarded by the peculiar structure of the Dominion, which consists of four groups of colonies, sundered from each other by uninhabitable spaces of great extent, and naturally related to the adjacent parts of the United States more closely than to each other. A plan for an international Zollverein embracing the two countries has been proposed, with the sanction of the late Pres. Garfield, and receives some support from the French-speaking population of the province of Quebec, but has met with no favor from the Dominion authorities.

The United States of America proceed with the work of converting their territory into self-governing States, and seek no fresh accession of territory, the last proposal, that of Pres. Grant for the annexation of San Domingo, having been rejected by the American people. But the treaty of reciprocity with the Sandwich Islands was contracted, and is defended, on the ground that the rapid extinction of the native population may lead to the annexation of these islands to some civilized country, and that the treaty gives America the best claim should that contingency arise.

As regards our neighbors, our good offices have been invited in the interests of peace by both Guatemala and Peru—requests which indicate the propriety of establishing for this continent something like the state system of Europe. The republics of America are too much isolated from each other. In commercial intercourse they court relations with Europe rather than with other parts of their own continent. The rise of a great and thoroughly peaceful power in America, liberated from internal divisions and desirous of no foreign conquests, seems to indicate the possibility of arrangements for the permanent preservation of peace and good-will among all the American nationalities. Pres. Garfield, and at first Pres. Arthur, gave their sanction to a movement for this purpose by calling a congress of representatives from all the American states. But after Mr. Blaine was succeeded by Mr. Frelinghuysen in the Secretaryship of State the proposal was withdrawn, and the policy of isolation and mutual indifference has been resumed. The need of some arrangement for the preservation of peace is shown by the existence of no less than four questions of more than national importance on the continent:

(1) The fisheries dispute between British America (Canada and Newfoundland) and the United States. The solution furnished by the Treaty of Washington was temporary in its character, its terms being so unfavorable to the United States that its renewal upon expiration was not to be expected. The award of the Halifax board of arbitration has not been accepted by any class in America as just, and therefore permanent, and the Congress of 1882–83 was in nothing more unanimous than in giving the notice required by the treaty that the arrangement would expire in 1884.

(2) The dispute as to the boundary-line between Guatemala and Mexico. Pres. Barrios of Guatemala visited the United States in 1881 to ask the good offices of the Government at Washington in deciding this question, and received some general assurances of willingness to act in case both parties referred the matter to American decision.

(3) The creation of a British colony at Honduras, in spite of the assurances given by resolution of the British Parliament in 1819, and by diplomatic statement at the date of the Clayton-Bulwer Treaty. Upon this violation of a mutual understanding the Washington Government has based its declaration "that that treaty is no longer binding upon the United States, and that such guarantees as it furnished with reference to an interoceanic canal are at an end." (See CLAYTON-BULWER TREATY.)

(4) The claim of certain European powers to unite with Colombia in a joint guarantee of the neutrality of the canal which is in course of construction at Panama has met with resistance from the United States, both on the general principle of control of the continent by its own people, and because such a canal would form virtually a part of our coast-line. Nor has the use of the Suez Canal in the recent war waged in Egypt by England been reassuring to Americans.

Area and Population.—The latest census and other reports furnish the following figures:

	Area in sq. miles.	Last census.	Population.	Increase of a decade, per cent.	Density per sq. mile.
I. NORTH AMERICA......	9,537,154	......	64,377,646	....	7·18
Polar Regions..........	492,368				
Iceland....................	40,459	1880	72,438	3·81	1·79
Greenland................	837,774	1880	9,531	2·99 (dec.)	·01
Labrador ....(*circa*)	420,000	.. ...	12,527	....	·03
Newfoundland	42,734	1874	181,753	19·2	4·25
Canada....................	3,372,290	1881	4,324,810	18·0	1·29
St. Pierre-Miquelon ..	91	1879	5,224	9·98	57·41
United States............	3,580,242	1880	50,152,866	30·0	16·57
Mexico....................	751,177	......	9,577,279	....	12·79
Bermuda.................	19	1881	13,948	15·7	734·00
II. CENTRAL AMERICA..	305,531	......	7,363,877	....	24·11
Guatemala	46,774	1881	1,252,497	4·6	26·75
Honduras	46,519	......	250,000	....	5·39
Salvador..................	7,028	1878	554,785	....	78·99
Nicaragua................	51,662	1877	300,000	....	5·80
Costa Rica...............	19,985	1874	185,000	....	9·25
British Honduras.....	7,562	1881	27,542	11·1	3·63
Panama	31,598	1870	224,600	....	6·15
Cuba and adj. isl'ds..	45,949	1878	1,424,649	0·7	31·00
Puerto Rico..	3,531	1880	754,313	....	213·62
British West Indies...	13,321	1881	1,206,522	5·0	90·57
Danish " ..	139	1880	33,763	11·9 (dec.)	242·89
Dutch " ..	446	1879	42,447	15·1	95·17
French " ..	1,104	......	355,759	....	322·24
Hayti......................	9,232	......	572,000	....	61·09
San Domingo...........	20,597	1881	180,000	....	8·73
Uninhabited islands	89				
III. SOUTH AMERICA....	7,755,535	......	28,380,371	....	3·66
Colombia..................	289,143	1870	2,774,000	....	9·59
Venezuela................	439,251	1881	2,075,245	16·8	4·73
Guiana	167,593	1879	347,600	....	2·07
Ecuador	248,386	1878	1,146,033	....	4·61
Peru........................	420,000	1876	3,050,000	....	7·26
Bolivia	430,899	1878	2,325,000	....	5·39
Chili........................	300,000	1878	2,420,500	....	8·06
Argentine Repub. and Patagonia....	1,095,013	......	2,400,000	....	1·27
Uruguay..................	72,178	1880	438,245	....	6·07
Paraguay..................	92,008	1876	293,844	....	3·19
Brazil......................	3,287,963	1872	11,108,291	....	3·36
Galapagos Islands....	2,951	......	60	....	0·02
Falkland "	4,839	1881	1,553	....	0·32

This gives a total area of 16,619,995 miles, with an aggregate population of 100,121,894. Of this population, 43,764,853 belong to what has been called Latin America, and 56,352,260 to what we may call Teutonic America. English is the official language of 54,694,768; French and English, of 1,359,027 (in Quebec); Danish, of 115,732; Dutch, of 187,508; Spanish, of 39,516,913; Portuguese, of 3,287,963; French, of 959,983. The data for a religious census of the continent have not been collected, but it may be said that its population is divided nearly equally between Catholic and Protestant Christianity, with a preponderance in favor of the latter. The pagan element is small compared with either. The figures given above are in general only approximate. No survey has been made of many extensive regions, and of some none ever will be made. Official, recent, and trustworthy reports are furnished by Canada, the United States, Salvador, Cuba, Puerto Rico, the Danish and Dutch West Indies, Dutch and British Guiana, Venezuela, and perhaps Uruguay. Brazil and Guatemala furnish census reports for some provinces, and official estimates for others. In many states of Central and South America the result is vitiated by the neglect to enumerate that part of the aboriginal population which still maintains a separate existence under a tribal organization. The statistics as to the aborigines, the negroes, and persons of foreign birth are generally imperfect, but we give separately below such as are accessible:

	Aborigines.	Negroes.	Slaves.	Europeans.	Asiatics.
British Amer....	108,547	21,394	....	509,253	4,383
Greenland........	9,294				
Alaska........	30,012				
United States....	256,127	6,577,151	....	5,774,411	105,613
Mexico........	5,000,000				
Central Amer....	2,021,000				
West Indies......	....	....	227,902		
Colombia........	50,000				
Venezuela........	....	....	....	25,589	
Guiana........					
Ecuador........	200,000				
Bolivia........	245,000				
Peru........	350,000	52,588	....	18,082	51,186
Chili........	50,000	....	....	16,342	
Argent. Repub.	....	....	....	351,200	3,400
Patagonia, etc....	24,000				
Uruguay........	....	....	....	96,355	
Paraguay........					
Brazil........	386,995[1]	1,954,452[1]	1,510,806		

[1] The mulattoes and other mixed races in Brazil number 3,801,782; in Peru, 669,457.

Debts, Revenue, and Expenses.—A financial comparison of the American states may be made by the aid of the following table:

	Debt.	Revenue.	Expenditures.
Newfoundl'd and Labrador..£	302,000	205,000	230,000
Canada (1880-81)........	199,561,538	29,609,161	45,906,058
United States (1881-82)........	1,675,023,474	403,525,250	257,981,439
Mexico (1881-82)........	144,953,785	25,725,000	25,221,696
Guatemala (1881)........	7,139,169	7,479,719	7,313,889
Honduras (1880-81)........	1,578,609	861,970	759,930
Salvador (1880)........	2,078,885	3,272,740	3,122,063
Nicaragua (1879-80)........	1,177,274	2,436,093	2,570,137
Costa Rica (1880)........	6,258,629	2,802,279	3,460,597
Cuba and Puerto Rico........	....	63,789,138	59,271,188
Hayti (1876-77)........	23,690,600	4,194,988	4,023,687
San Domingo (1882)........	312,500	1,500,000	1,500,000
Jamaica (1879)........£	718,609	547,004	561,363
British West Indies (1879)....£	148,512	879,313	811,054
Bermuda (1879)........£	13,234	25,721	28,269
British Honduras (1880)........£	....	43,234	37,923
Colombia (1879-80)........	73,585,644	4,838,800	7,269,932
Venezuela (1880-81)........	67,309,990	4,680,000	4,448,000
British Guiana........	24,447	409259	417,995
Dutch Guiana and Antilles (1882). ...fl.	....	1,698,575	1,895,798
French Guiana and Antilles (1882). ..fr.	....	10,072,000	
Brazil (1881-82)........mil.	407,716,057	58,479,000	59,143,529
Ecuador (1878-79)........	16,370,000	2,845,000	2,585,000
Bolivia (1873-74)........bol.	42,900,000	2,929,574	4,505,504
Peru (1875-76)........	213,882,688	33,300,832	32,531,561
Chili (1881)........	74,582,048	16,920,000	17,057,721
Argentine Republic (1881)......	81,596,952	19,898,777	19,836,501 (1881)
Uruguay (1879-80)........	47,861,042	8,252,087	7,857,275
Paraguay (1879)........	251,000,000	219,599	270,031

NOTE.—In this and the following tables the *dollar*, the *peso* or *peseto*, the *sole*, and the *venezolano* are treated as equivalents. As a money of account the *boliviano*, of Bolivia, is actually worth about three-fourths of a dollar, although the coin of that name is worth a dollar. The *milreis* of Brazil is worth but half a dollar. In European moneys, 3¾ Danish *crowns*, or 5 French *francs*, or 2½ Dutch *florins*, are worth a dollar. In all cases (except for Guiana in one of the tables) the figures are given in the current money of the country, and not in any uniform money.

These statistics, however, are misleading unless the differences in the constitutions of the various governments are borne in mind. Centralized national governments like Brazil have to discharge many functions and incur many expenses from which federal national governments are exempt. And to ascertain the real cost of a government of the latter class it is necessary to add to the national budget those of the states or self-governing provinces into which the country is divided, and also to add to the budgets of both classes the costs of strictly local or municipal governments. Statistics for this purpose, unfortunately, are not available, for even the census laws of the United States contain no provisions for ascertaining the real cost of the whole system of government to the people. But the following statistics of state debts and expenses in federal governments are of value:

	Debt.	Revenue.	Expenses.
Canada (1881)........	£39,825,100	£5,942,400	£5,115,800
United States (1880)........	231,438,761	56,379,679	
Mexico........	....	7,500,000	7,370,000
Argentine Republic........	....	172,054,885	182,137,054

No returns are accessible for Colombia and Venezuela.

Commerce.—In the absence of exact statistics as to the production, consumption, and accumulation of wealth, we have the statistics of foreign commerce, which furnish a rough though often misleading indication of national resources:

	Exports.	Imports.	Balance.
Newfoundl'd and Labrador..£	18,315,000	18,019,000	+296,000
Canada (1881)........	98,290,823	105,330,840	−7,040,017
United States (1881)........	650,619,000	902,377,346	+250,712,718
Mexico (1879-80)........	32,663,525		
Bermudas (1880)........£	84,000	249,000	−165,000
Guatemala (1881)........	4,081,000	3,665,000	+1,419,000
Honduras........	594,840	640,143	+45,303
Salvador (1876)........	4,902,436	2,705,410	+2,197,026
Nicaragua (1880)........	2,057,622	1,470,114	+597,508
British Honduras (1880)........£	252,855	237,204	+15,651
British West Indies (1880)....£	6,157,000	6,203,000	−46,000
Spanish " (1878)......	80,137,054		
French " (1879)..fr.	73,413,000	67,906,000	+5,507,000
Dutch " (1881)...fl.			
Danish " ....kr.			
Hayti (1881)........$	8,544,049	10,471,250	−1,927,201
San Domingo (1881)........	1,691,075	1,761,316	−70,241
Colombia (1880-81)........	15,836,940	12,071,480	+3,765,460
Venezuela (1875-76)........	16,113,000	15,043,000	+1,070,000
Ecuador (1879)........	9,377,929	7,500,000	+1,877,929
Guiana........	21,444,895	20,339,700	+1,105,295
Peru (1877)........	43,915,572	24,179,095	+19,736,477
Bolivia (1879)........bol.	50,000	70,000	−20,000
Chili (1880)........$	51,648,000	29,716,000	+21,932,000
Argentine Republic (1881)......	56,039,000	52,818,000	+3,221,000
Brazil (1879-80)........mil.	222,351,700	173,612,300	+48,739,400

An examination of the source and destination of these imports and exports shows that the commerce between the nations of the continent is less, and that with Europe much greater, than might be expected. Thus, in 1881, Mexico, Central America, and South America (excluding Paraguay, Ecuador, and Guiana) bought of the United States goods to the value of $35,953,964; of Great Britain, $92,160,497; of France, $73,175,009. The same countries sold to the United States to the value of $88,884,260; to Great Britain, $76,312,975; to France, $77,108,449. This inequality is due chiefly to the fact that the carrying-trade is in the hands of Europeans.

(For accounts of the particular countries see their names in the general alphabet.) (R. E. T.)

AMERICAN. For "American" mammals, birds, reptiles, fishes, plants, trees, etc., see under name of the animal or plant.

AMERICAN ART. See FINE ARTS.

AMERICANISMS. In works by American writers many words may be found which are not their invention, but are taken from popular use, and which are either unknown to Englishmen or used by them in a different sense. These terms are occasionally really new words, fashioned in a new country to represent new ideas or to name new tools, or they are old English roots which have sent up new suckers, full of new meaning, though still bearing the image of the parent stock. To these must be added words of foreign tongues which the English of the Americans has adopted and amalgamated with its own stock. Such are *Americanisms*. Their number is largely increased by terms which once were part of the English speech, but have fallen into disuse in their native land, while they have continued to live in America. Thus, *peart*, probably a corruption of *pert*, is continually mentioned as a word exclusively used in the United States, while it is a good English word of the seventeenth century. Little attention has as yet been paid to this important and interesting part of the language. A vocabulary by the late John Pickering, a *Dictionary of Americanisms*, by John Russell Bartlett, and *Americanisms*, by Schele de Vere, constitute wellnigh the whole literature. Smaller works devoted to the Americanisms of limited localities, like the *Pennsylvania Dutch*, by S. S. Haldeman, and the *Glossary of Supposed Americanisms*, by Alfred L. Elwyn, are valuable contributions to the science of philology. Mr. J. R. Lowell's humorous *Biglow Papers* should not be overlooked by any that wish to investigate the subject.

Americans deplore the small number of Indian names and Indian words which survive. As the very name *Indian* arises from the mistake made by Columbus, who thought he had reached distant Ind, so his enemy, the Englishman, has been doomed to survive in the mysterious *Yankee*. Rev. Mr. Heckewelder states that the Indians pronounced it *Yengees*, and "knew how to distinguish them from the Virginians" (*History of the Indian Nations*, p. 132). Now, the *Yankee* is almost exclusively the man of New England, though during the Civil War the Northern soldier bore the name of *Yank*, and the Confederate soldier was a *Reb* (rebel) in Northern speech. The so-called national song, "Yankee Doodle," has an air which is found among many nations. Kossuth recognized it as an Hungarian air, and Prince Napoleon as one of the ancient sword-dances of the Basques. The indefatigable brothers Duyckinck trace it to an old laborers' song in Holland. Others maintain that Dr. Shackburg of the British army composed the song, but its first American appearance dates from the battle of Bunker's Hill, when a lad played the familiar tune on his fife.

Even the roughest of Indian names sound pleasant, and many are full of music. To the beauty of sound, local names frequently add the interest of historical associations. Virginia, when seen by John Smith, called her rivers *Potomac*, *Powhatan*, and *Rappahannock*. When Elizabeth called herself queen of Virginia the beautiful original names gave way to loyalty: the Powhatan became the *James River*—still very generally called *Jeames*—and the shires, beginning with *Henrico*, were named *York*, *Lancaster*, and *Northumberland*. In like manner, Pennsylvania inherited from the native owners her melodious *Susquehanna* and *Wyoming*; then the older counties recall by their loyal names of *Chester*, *Northampton*, etc., the memory of early English settlers. *Lehigh* and *Allegheny* prove by their return to Indian names the change in public opinion after the War of Independence. The Germans also left their mark in towns called *Womelsdorf* and *Mannheim*, while the Moravians formed colonies known as *Bethlehem* and *Litiz*, said to be their form of *Lætitia* (?).

A considerable number of Indian phrases have become integral parts of the English of America, having generally made their way into every-day language through political slang. Thus, "digging up the hatchet," and, more frequently, "burying the hatchet," to be "on the war-path," and to "hold a powwow," became popular expressions, and now scarcely betray their Indian origin. Politics are also largely responsible for the countless terms applied to drink and drinking; the most of these are mere slang. *Corn-juice*, originally whiskey made of maize, is common in the West, while *camphene* and *benzine* are Eastern disguises for strong drink. The sad effects of "indulging in it" are often called the "*jim-jams*." The principal cereal of the United States is universally called *corn*. The spikes of this plant are called *ears* as long as the grains are still attached, but *cobs* when these are removed, while the outer covering of the ear is called in the South the *shuck*, and in the North the *husk*.

As with the Indians, the traces left by the Dutch on the face of the country are more numerous and important than their contributions to the language. Hills and mountains, lakes and rivers, bear their old Dutch names, though often disfigured. Thus, the New York thoroughfare, the *Bowery*, shows little trace of the pleasant *Bouwery* (the garden-bower) of old Dutch governors. Nor would the old village of Breukelen, near Amsterdam, recognize its godchild in the city of *Brooklyn*. The *Knickerbockers* are honored by having their name bestowed upon all worthy descendants of old Dutch families. A far wider application was, unfortunately, made of the word *Dutch*. As Archbishop Trench tells us, "Till late in the seventeenth century *Dutch* meant (in England) generally German, and a *Dutchman* a native of Germany." It is evident that this arose not from a tendency to underrate Germans, but from a courteous effort to call them by their own name, *Deutsch*, which but too readily changed into *Dutch*. The Americans, therefore, only follow the example of their forefathers at home if they still continue to call all Germans *Dutchmen* and their language *Dutch*. True to their national fondness for good cheer, the Hollanders have left behind them many a favorite dish that still bears the original name. The *donnets* survive as *doughnuts*. Their *kool-slaa* (literally, cabbage-salad) is still popular among their descendants, and frequently written *cold-slaw* in an effort to preserve the sound, though the spelling be lost. The *stoop*, as designating the place between the steps leading up to the house and the door, is a genuine Americanism due to the Dutch, for the burghers loved to sit on their *stoeps* (seats) smoking their pipes. Now *stoop* is the name for any covered or open porch with seats in front of a house. The word *bush* has in some places taken the Dutch meaning of a region abounding in trees and underwood (*bosch*). It is not likely that the term *bushwhacker* is a genuine Americanism, though it is hardly known in England. Originally used to designate the process of propelling a boat by pulling the bushes on the banks of the stream, it became afterwards a name for lawless persons and fugitives from justice who took refuge in the bush.

But the word which of all Dutch terms has acquired the widest circulation and the strongest hold on American speech is *boss*, derived from the Dutch *baas*. Originally used in its primitive meaning of master or overseer, it became customary to speak of a *boss tailor* or a *boss carpenter*, meaning a mechanic who employed several *hands* or workmen. Soon the word became widely popular. It has even been turned into a verb, and to "*boss* a job" is a common expression for undertaking a business. The word, harmless in itself, has passed into politics, and become part of the history of the nation. The head of a party, the manager of an intrigue, the patron of a bill in Congress,—each is called the *boss*.

There is another Dutchman whom all American children hold dear and in great veneration. This is *Santa Klaus*, as it is universally though incorrectly written, being in reality *Klaas*, the abbreviation of Nikholas, a saint of undisputed Dutch nationality. But in Pennsylvania the bringer of Christmas gifts is *Kris Kinkle* (softened in Philadelphia to *Kris Kingle*), an adaptation of the German *Christ-Kindlein*, the Christ-child.

Few only are the Americanisms which owe their origin to the *French* settlers in this country. This is the more surprising as the French once owned Acadie, maintained for several generations an unbroken chain of missions and forts all along the Western frontier, and settled in large numbers in Louisiana and other parts of the South. French colonies were attempted in Michigan and in Florida; *Gallipolis* bore the name of its founders in Greek, as *Frenchtown* in English; *Beaufort* and *Port Royal* still speak of the Huguenot in South Carolina, as *Castine* and *Mont Desert* in New England remind us of the zeal of the Jesuits in the seventeenth century.

A few great landmarks still bear the French impress, as the lake which bears the name of Henry IV.'s brave servant, Samuel de *Champlain*, or the *bayous* of Louisiana. Gen. Fremont first introduced the word *butte* for detached hills or ridges; subsequently the word became a verb, and in the Northwest is currently used for chopping off something with a dull axe. The Mississippi River has in like manner enriched the national idiom with the two terms *crevasse* and *levee*. The former designates a break in the vast embankments designed to keep the turbulent waters within their limits, while the *levee*—or *levy*, as it is often written—is the name of the embankment itself. Ridiculous is the use of this word, in the sense of the *lever* of French monarchs, to designate the days on which the President of the United States holds his public receptions.

The *prairies*, the vast stretches of land in the West, still bear their French name. Common people are fond of emphasizing the word by pronouncing it as if it were spelt *per-rairie*. The so-called *prairie-hen* is the pinnated grouse, and the *prairie-dog* is a marmot, owing its name only to its sharp bark. Its Western name is *gopher*, perhaps the descendant of the French *gaufre*, perhaps of the Old English *goffer*, to flute or crimp, with reference to the crimped or honeycombed appearance of the soil in which it burrows. The *prairie-wolf* is an exclusively American variety, the size of a setter-dog, and living in burrows; at the South it commonly bears the Spanish-American name of *coyote*.

Travelling by water makes us acquainted with the French *sault*, a low waterfall or rapid, betraying its old age by the presence of the *l*, which has since left the French word. Commonly pronounced *soo*, it survives with the *voyageur* of olden days. The use of *rapids* in the plural, derived from early French missionaries, is peculiar to American English, and serves to make a nice distinction between a considerable descent in a river and a real cascade. These *rapids* not unfrequently necessitate a *portage*, over which travellers carry their light canoes (often called simply *birches*) to avoid danger. If this is not done, the canoe, or even the immense steamboat navigating the St. Lawrence, is made to "*shoot* the river"—to dash over the rapids in the swift current. The term comes, of course, from the French *chute*, a name given to every place where a river hemmed in between high rocky banks is forced to fall with great violence to a lower level.

The French word *caravane*, formerly familiar to all settlers in Virginia, Kentucky, and other States, is gradually disappearing, and in the South has almost entirely given way to the Mexican *conducta*. *Bateaux* are still employed on the water-courses of old States like Virginia, while the *cache*, the hiding-place of valuable property, has survived only in the far West.

Louisiana, with its strange mixture of races, has produced a few new words, genuine Americanisms, like the *griffin* (Fr. *griffon*), a mulatto, applied most frequently to a woman; *quadroon*, occasionally written *cuarteroon*, the offspring of a white man and a griffin; and *métif*. hardly yet fully adopted, the child of a white man and a quadroon.

At the other end of the continent, in Canada, the *calèche* of the early Acadians has become *calash*, meaning now an old-fashioned gig, and now the unbecoming head-covering known in England as an *ugly;* while the *carriole* has degenerated in almost all the States into the ludicrous *carryall*. A strange survivor is the *vendue*, very generally used in the Middle States to designate an auction sale. That the *vacher* of the early French missions should have become the *herder* of Western English is a legitimate change, but when the *bois brulé* of Missouri is called *Bob Ruly*, or the Rivière du Purgatoire reappears in New Mexico as *picketwire*, the soul of the philologist suffers sadly. The *buffalo chips*, as the great West calls, not inappropriately, the *bois de vache* of the French, has cast aside all delicate disguise of the disgusting but precious fuel, and now is called bluntly *bodewash;* it is the *easings* of Grose's *Dictionary*. In like manner, the fair shrub now known as *Osage orange* used to be the *bois d'arc* of the French, who valued the bows made of such wood. The American has renamed it *bodark*, or, shorter still, *bodok*. Families have a better right to complain of the ill-treatment which their French names have suffered. A Mr. *Bon Cœur* was called in New England Mr. Bunker, whence Bunker's Hill; *Pibaudières* became *Peabodys; Bonpas*, *Bumpus;* and *De l'Hôtel* actually *Doolittle!*

Savey is the one *Spanish* word which is used all over the southern part of the Union. For there, where once the Spaniard ruled supreme, his *Quien sabe?* early became familiar to American ears, and the word was generally adopted to designate almost any kind of knowledge. The Spanish reverence for blood transplanted from old Castile to the New World has given America the *mulato*, denoting a mixed breed, now written *mulatto*, and the colored freedman sees no longer a term of reproach in the Spanish word *negro*, provided it be not changed into vulgar *nigger*. His nickname during the Civil War, *contraband*, proved not to be an Americanism, having been used in the same sense in English works of travel long ago, as in Capt. Canot's *Twenty Years of an African Slaver*. The *pickaninny*, in Boucher's *Glossary* so amusingly derived from the two Spanish words *pequeño niño*, owes its origin more probably to Africa, and has found its way into the *Slang Dictionary* (p. 200). The *creole* comes directly from the *criollo*, the Spanish name for a child born of European parents in the West Indies or on American soil. Now it designates any one born in the tropics, without regard to race or color. In Louisiana alone an admixture of French blood makes the real *creole*, and hence his patois, consisting of French words more or less disguised, an admixture of English and a few genuine African words, is known as *creole French*. The learned librarian of Harvard University has studied the interesting dialect with great success, and published the result of his labors. The Spanish *filibustero*, originally a small swift vessel, and then a lawless adventurer sailing in such a craft while bound on piratical errands, has given us *filibuster*, which came first into use in 1851 during the attack of Lopez on the island of Cuba. The *palmetto*, called *palmita*, or "little palm," by the Spaniards, has been thoroughly Americanized as far north as South Carolina, to which it gives its flag and its name as the "Palmetto State." The New West has made the *cañon* almost an English word since these vast gorges have become known to travellers. In California the mountain-torrents flow through *gulches*, the *wet-diggings* of the gold-regions. The *gulch*, however, often quoted as of Spanish origin, is nothing but the good Old English word for ravine. With the discoveries of deposits of precious metals the Spanish word *placer*, meaning at first simply pleasure at coming unawares to a rich gold-mine, has become familiar, and now means not only the drift-sand which contained gold, but any good thing which promises a liberal return of profit. It holds its own in spite of the more recent *bonanza*, another Spanish term of similar meaning. The prairies of the South suggested to the followers of De Soto the snow-white *sabana* of their home, and thus the word was transferred from Florida to the city of Savannah. The *sierra*, which raised such a storm between Archbishop Trench (who found its origin in the Spanish word for a *saw* with its sharp teeth, a form recalled most strikingly by such mountains) and Mr. G. W. Moon (who pleasantly derived it from two Arabic words, *sah* and *rah*, meaning a desolate mountain-tract), has become a genuine part of American speech. The *rancho*, the farm of the Spaniards in former Mexican provinces, has been fully adopted as *ranch*, and the owner is styled a *ranchman*.

If it cannot be satisfactorily explained why the former owners of so large a proportion of our country, the French and the Spanish, have left so few traces of their idiom in our speech, the wonder becomes still greater when we find that the Germans have not enriched the language by a dozen words. The German cosmopolitan abandons with painful promptness his native tongue and his national characteristics, frequently long before he is naturalized. There can be no doubt, however, that such recent words as *standpoint*, from *Standpunkt*, *outlook* from *Aussicht*, and others, owe their adoption to the German idiom. The same is true of their favorite drink, and no American can plead ignorance of what *lager* and *bock beer* mean; he sees and smells the *sour-crout* (*Sauerkraut*) of his German neighbors, and learns to appreciate their *apple-butter*, the result of long-continued stewing of apples in cider.

Among his own race in the far South the negro still clings to the term *buckra*, imported from the West Coast of Africa, and originally meaning a spirit and powerful being, and then, by a natural transition, white man. In his new home he used it to designate anything specially good, as the *buckra yam*, which, to deserve the epithet, must be white and good at the same time. Among spurious Americanisms *cuffey* stands foremost. Constantly spoken of as a negro term, it is nothing more than a corruption of the slang term *cove*. Thus also the familiar terms "uncle" and "aunt," by which for long generations negroes were generally spoken to, were, as we find in Grose's *Dictionary*, applied already in his time, "in Cornwall, to all elderly persons." The house- and stable-servant went, in like manner, universally by the name of "boy." On the other hand, the black nurse was known to all by the endearing term of "mammy." It is frequently sounded and written *maumer*, thus endangering the identity of the pleasing term. Among negro Americanisms it would perhaps not be amiss to count the only really national poetry which Americans possess. In 1835 a new song, "Jim Crow," was brought out on the New York stage by a Yankee. The words may not have been strictly original, but the melody was negro in form and in conception. This was quickly followed by other songs of the same kind, and a variation sprang up in the form of descriptive ballads, like the song "Ole Dan Tucker," and for a time this African inroad drove nearly all other musical compositions from the publisher and the private performer. Although the negro is naturally full of cheeriness and fun, his airs are all sad and resigned, and, what is noteworthy, as sad and mournful since his liberation as before.

It was to be expected from all that is known of the *Chinese* idiom and of Chinese music that neither in song nor in daily intercourse the "heathen Chinee" would ever make a valuable addition to English. F. B. Harte's well-known poem of "Truthful James" first bestowed upon John Chinaman in California the above title. The number of Chinese is, however, as yet too small, and their ways of life are too far removed from those of the Saxon race, to promise that they can ever exercise a permanent influence on the English spoken in America. Their inability to utter certain sounds, as certain initial vowels and the letter *r*, will always present a serious obstacle. Nevertheless, *first-rate* has very largely given way to *first-chop*, and *Joss*, though only a slang word, has most strangely as such recovered the meaning of its original form, which was not Chinese at all, but the pure Castilian word *Dios*. To *kootoo*, in the sense of bowing obsequiously to others, has come to the New World not directly from China, but through England. Perhaps the most familiar Chinese word to American ears is the name of the herb ginseng, a variety of *Panax*, the root of which is exported from America to heal suffering Chinamen. It has undergone mutilation, and appears now uniformly as *sang*. Men and women are said to go *a-sanging* when they start to gather the plant, and Sang Run in Maryland owes its odd name to the abundance of ginseng formerly growing along its banks.

The majority of Americanisms come naturally from the West, that part of the northern continent where all the characteristic features of American life are most fully and most strikingly developed. The vast proportions which Nature assumes in this the most magnificent domain that was ever thrown open to all who had but the will, the courage, and the energy to take possession, led almost intuitively to a love of hyperbole in speech. All these new objects, all these new sensations, called for new words. The very absence of all healthful control and of all sound criticism only served to let the new speech develop itself more freely and more ingenuously, acknowledging no master in deed and none in word. Hence Western speech is full of unbridled energy, of youthful enthusiasm, free as Nature herself, dropping words that prove useless or inadequate as promptly as they had been coined and made current when they appeared to be wanting.

The *back country* designates the mountainous belt of land lying back of the seaboard States, and the *up country* remains a term implying inferior culture and want of progress. *Down East*, on the contrary, means mainly the New England States, proud of their history and of their high state of culture, culminating in the city of Boston, hence frequently called the "hub of the universe." And yet the Down-Easter leaves his home and may be found all over the Union! It is he who, next to the immigrant, takes up most *grants*, as the lands are called which new railways obtain from the Government in aid of their enterprises, as the British Government in old times used to make grants to all who were willing to *plant* colonies. Hence these colonies were called *plantations* at the North as well as at the South, though now the New Englander knows only *farms*, which in the South appear invariably as *plantations* owned by the sugar- or cotton-*planter*. The *manors*, as the grants of the early Dutch rulers of New Netherland were called, have disappeared under the pressure of republican institutions, and with them the *patroons*, as the owners were styled. In Virginia, Crown grants were commonly *blazed out*, or *blazoned*, by cutting some marks in the bark of a tree. The word (from the French *blason*) has grown into an Americanism: a new-comer *blazes out* his pre-emption right on the tree-trunks, or he *deadens* the tree for the same purpose by belting or *ringing* it—*i. e.*, cutting off a circular piece of bark, so as to prevent the sap from rising. Rights thus secured constitute a *claim*, the name given to the land as well as to the title acquired. The Western settler, however, frequently dispenses with all ceremonies and becomes a *squatter*, originally a man who *squats* down on the ground and refuses to move. The word *diggings* has become familiar to English ears from its use in the gold-mines of Australia. There it generally denotes only a place where precious metals are dug for, but as an Americanism it serves to designate any special locality.

The new settler, looking out for *new land*, which has not yet been *taken up*, either by actual occupation or by entering a record in the land-books, always prefers *prairie-land* if it can be had, and then looks for an *island*, a grove of trees in the centre of a prairie, or at least for *bottom*, as the richest land is called. He finds the latter not unfrequently at the foot of *bluffs*. If their form is changed into long, low ridges forming a water-shed, they are known as *divides*. *Flats* are in the far West alluvial lands lying close to a river, or are very large shoals in a river. *Alkali flats* are districts covered and encrusted with gypsum and salts of soda. *Hog-wallows* and *sink-holes* abound in limestone regions, the former a series of monotonous hollows and hillocks, the latter unpleasant indentations in the soil whence frequently powerful springs suddenly issue. The *hammocks* of the South are gently-rising hills covered with valuable timber. In the North-west similar hills reappear as *knobs*, and any hilly region is apt to be called a *knobby* country. A striking contrast is frequently observed there between *oak openings*, as beautiful forest glades are called irrespective of oaks, and *barrens*, waste lands bearing neither grass nor trees. The *oak barrens* of the West have their kindred in the *pine barrens* of the South. In *pineries*, on the other hand, valuable timber is obtained, and the population is far superior to the *tar heel*, the nickname of the dweller in barrens. "Drought" resumes here its Miltonic sound of *drouth*, and "to dry" reverts often to its ancient form, *to drow. To dry up*, originally pure slang, threatens to become a regular Americanism in the sense of to cease and make an end.

The American use of the word *lot* for any piece of land has been traced back to the early Puritan settlers. *Across lots* designates a short cut from one place to another. Nor is the word *lot* confined to land used by the living, for most men provide a *cemetery lot* for themselves and their families.

The relative value of forests for fuel or "timber" has led to the use of the latter word for any wood throughout the West. People were formerly said to *take to the timber* when the approach of Indians on the war-path compelled them to leave their houses and seek refuge in the forest. Seeking shelter in the branches of a tree led to the phrase *to tree* one's self or *to tree* game. When dogs are helping in the chase they often mistake the tree on which an opossum may have found safety, and then they are said to have been "*barking up* the wrong tree." The phrase is also applied to similar mistakes in every-day life. Of all features of wood-life, the *stump* has probably acquired the greatest popularity, and this from the very modest merit of furnishing in its slight elevation from the ground a convenient place for public speakers. The candidate for an office *takes the stump*, and he becomes an eminent *stump-speaker*. The *chunk*, a stump or any large piece of wood, may be only a corruption of Old English *chump*. In the West, however, it has made its way into good society, and denotes anything short and thick. *Truck*, originally used to designate any "small produce, cloth or the like," has come to mean in America almost exclusively the small produce of gardens, and has led to the formation of *truck-patch*, in which the smaller vegetables and fruits are raised.

The new settler generally built his log cabin without help, but when he proposed to erect a house he had a *raising*, as the setting up of the timbers was called. All the neighbors gave their aid, calling it a building-*bee* or a raising-*bee*. In like manner, we find the phrases chopping-*bee*, husking-*bee*, quilting-*bee*, and even spelling-*bee*.

The independent son of the West highly values his trusty axe, and hardly knows a greater misfortune than that axe and handle should part company. This has given rise to the genuine Americanism of "flying off the handle." If a fair lady loses her temper, or, worst of all, if she breaks the tender promise, she is said to *fly off the handle*. If the axe has any rival in the hunter's love, it is his rifle. The old-fashioned gun would often do nothing more than make the powder flash in the pan, and the incident survives in the favorite word *fizzle*. The term has expanded in its meaning till now it signifies any ridiculous failure after a great effort. An unsuccessful speaker makes a complete *fizzle*, and failures in college are called *fizzles*.

There can be little doubt that the curious expression, "to be a caution," now no longer slang, arose from the caution required by new settlers in their intercourse with Indians. A *caution* may be a warning, a marvel, a stupendous thing. "The way in which Mr. Webster laid bare their intrigues was a *caution*," wrote an eminent New England author.

The Western man loves as little as his fellow-men all over the earth to speak of death, and thus he has created a host of euphemisms. His friend is *rubbed out* or *wiped out*, as English slang says, while in California he is *snuffed out* like a useless candle. The once poetical expression, *to go up*, has given way to words pointing in the opposite direction, *to go under*. The strangest term of all, however, is *to save*, apparently a violent contradiction. The lonely settler exposed to Indian "scares," as he called their sudden attacks, was very apt to boast that he had *saved* two or three. The word indicates the preciousness of shot and powder to him: an Indian merely wounded continues the warfare, and costs another shot, while the Indian who is killed *saves* him any further outlay.

Bear-meat and *deer-meat* have taken the place of *venison*, which is but rarely heard; *vegetables*, which he prefers to call *greens*, he does not know, unless it be in the shape of *roasting ears*. The bee-hunter has enriched English with the phrase "to strike a *bee-line*." Any energetic pursuit or rapid flight towards a certain goal is called *making a bee-line* for that point. *To honey* means to flatter and cajole, or, as a variation has it, *to be sweet upon* some one. *Honey-fogling* seems to be a genuine Americanism, unless it should be a corruption of *coney-fogling*, ascribed by Halliwell to Lancashire. In England it means to lay plots; on this side the ocean, to cheat or defraud.

The humorous son of the West also speaks of the discontented settler as a man who has *soured* on his *section*. The jilted lover *sours* on his former flame, and to lose money by the failure of a bank has *soured* the stockholders. In the far West, as Down East, sugar bears the names of *long* and *short sweetening*, according as it is the product of the cane (known also as *store-sugar*) or of the maple tree; for the Yankee loves his *sugar-orchard*, as he calls his often quite extensive grove of sugar-maples (*Acer saccharinum*), with its annual *sugar-parties*, when the owner, his family, and his friends go into *sugar camp* and gather the sap of the tree.

An amusing confusion of ideas, or of words, has led to the creation of the word *cuss*, once believed to be identical with the fuller *curse*, and now suspected of being simply a Western abbreviation of *customer*, in the sense of a bad or "ugly" customer. The doubt arises from the fact that *cuss* is by no means always used in a bad sense. "The d—— little *cuss*" is one of the most endearing terms known to backwoodsmen. The question is often heard, "I wonder if he did it out of pure *cussedness?*" In the latter case the resemblance to the *cursydnesse* of the Coventry Plays is, however, so striking as to plead for the descent of *cuss* from *curse*.

Was the far-famed *Lynch*, to whom we owe the *Lynch law* and the verb *to lynch*, an American or not? The question has been asked again and again, but, although no word in the list of Americanisms has perhaps been more thoroughly investigated than this, no decision has yet been adopted. Irishmen claim priority in their "James Lynch, mayor of Galway, who hanged his own son" in the year 1498. Another Lynch, who in 1687 was sent to America to suppress piracy, and with or without special license proceeded summarily against offenders brought before him, is a second claimant. The American Lynch, who is credited with the foundation of the town of Lynchburg in Virginia, and with having first administered Lynch law, is a myth. *Vigilantes* and *vigilance* committees are, of course, merely thin disguises under which Judge Lynch vainly tries to hide his hideous crime.

It must probably be ascribed to the perfect independence of State and Church from each other in

America that so many terms connected with religion should have found no place there or are altered in form and in meaning. Religion itself has thus come to be looked upon as a sort of commodity. The preacher exhorts you not to delay any longer, but to "*get religion*" at once. A person who has recently *joined the Church*, as another Americanism expresses it, will be asked how she likes *religion;* and she, most likely, beseeches her frivolous sister to mend her ways and to *profess religion.* The *church* also is not only the building, the house of God, but, contrary to English usage, the congregation also. Hence, a man who tells you that on such and such a day he *experienced religion*, will add that he proposes *joining* Pilgrim *Church* or some other *church*. The Episcopal Church, faithful to its English ancestry, still adheres to the term *parish*, though without territorial limits; New Englanders speak of their *societies*, consisting of persons only, and sometimes call their churches *meeting-houses.* They are sometimes recognized in England by their substituting the old term *steeple* for *spire*, which was, in years gone by, seldom heard in New England.

It is not to the Methodists, as is generally thought, but to the Presbyterians, that America owes the new word *camp-meeting*. Certain Presbyterian ministers held a sacramental meeting at a place called Cane Ridge in Kentucky in 1800. It was attended by more than 20,000 people, and was protracted for weeks. This was the first *camp-meeting* ever held in the United States.

The American minister who wishes to find a field of usefulness anxiously waits for a *call*, or invitation from a congregation to come and minister to their spiritual wants. When it is accepted he is *settled*, and if he should agree with his congregation as to his annual income, he is said to receive a *stated* income. As this is often scanty, amends are made by giving him regularly a part of the produce of their farms. Meetings of the church-members at his home for the purpose of making him presents are called *donation-parties.* Other social meetings have given rise to special terms. New Year's *remembrances* are fashionable in large cities, while in the West primitive *basket-meetings* take their place. When no notice is given the event is called a *surprise-party*. Of late a new word, *pound-party*, has been coined to indicate meetings where each person attending is by a tacit understanding expected to bring a pound of some commodity to be used.

Almost all the technical terms connected with government were necessarily brought over from Great Britain, and the State has, therefore, contributed as few Americanisms to our English as the Church. There are some points of difference, however, here also. The use of *Government* without an article, and still more of an adjective, *governmental*, is American. (Gubernatorial relates to State governors only.) So is also the use of *the Executive* to represent the President, and of *the Judiciary*, unknown in England. *Congress*—not, as elsewhere, *the* Congress—sits at the Capitol, but the *legislature*, as the corresponding body in each State is most frequently called, meets at the *State-house*, a relic of the Dutch *Stadhuys*, and the courts at the *court-house.* Of historic names adhering to portions of the Union, only two are their exclusive property, and as such can lay claim to being esteemed Americanisms. The *Old Colony* remains the title of what was originally *Plymouth* Colony, whose settlement preceded by a few years that of Massachusetts; and the *Old Dominion* is the cherished title of Virginia, earned by her loyalty to the Stuarts in the times of the Commonwealth.

Some of the Americanisms connected with politics bear the impress of the early days of the great republic. Thus, when members of Congress find themselves not able, unaided, to secure the passage of a measure of merely local interest, they are apt to resort to *log-rolling*, a term used to express the arrangement by which the early settlers combined to assist each other. The *axe*, or rather the *guillotine*, is made to represent the dismissal of Government officials upon the coming in of a new President or in case of some grave complication, and the victims are said to be *beheaded.* The English "contest" before an election becomes a *campaign;* the candidate who announces plainly his political views and intentions is said to have come out *flat-footed;* if found wanting in allegiance to his party, he is denounced as *shaky*, or at least *weak-kneed.* The latter is likely to be *dropped* by his party, while the favorite who shows that he has *backbone* is sure to be elected. Political slang has contributed to English speech at least one word which continues to baffle the ingenuity of philologists. This is the *caucus*, now as familiar to English ears and lips as it has long been to Americans, who are inclined to credit it to the word *caulkers*—if the sound has not misled them—since *caucus* occurs for the first time in 1735, when the shipowners of Boston held a meeting to decide on persons who were to be entrusted with places of power and influence. Adams's *Diary* mentions a *caucus club* as early as 1763. To speak of the creed of a party as its platform is an old English custom, but to refer to every *plank* of such a platform is a clear Americanism. *Spread-eagleism* is defined as "a compound of exaggeration, effrontery, bombast, and extravagance." The national emblem of the Union, the eagle, on occasions of political speaking is expected to spread its wings and to soar high—hence the Americanism. The same bad taste, not confined to politics, is apt to be called *high-faluting*, another as yet unexplained word of this class. *High-flighting*, *high-floating*, and the Dutch verb *verlooten*, have all been claimed as ancestors, but without satisfactory result.

Two rather mysterious Americanisms are the *shebang*, the name of a college-student's room, of a low drinking-house, or of a cheap theatre, and the verb *to skedaddle*, which was revived during the war to suggest precipitous flight, and has held its own ever since. *Shebang* is commonly traced back to a mal-pronunciation of the French *cabane; skedaddle* claims sometimes Irish, sometimes Scottish, descent. But of all explanations, the most plausible is, strangely enough, the theory that the word comes from the Greek *σκεδάννυμι*, meaning "I scatter, I disperse tumultuously," and used by both Herodotus and Homer. The *carpet-bagger* was the Northern man who, after the war, went to the South with all his earthly goods contained in a carpet-bag, hoping to return a rich man; and the *scalawag*, the Southern man who bartered his principles for political gain. To *bulldoze* is a later political term, originating in the South, and denoting the intimidation of voters.

Perhaps no walk of life leads to the adoption of more slang, but rarely rising to the dignity of a genuine Americanism, than commerce. Nor does its peculiar phraseology belong generally more to America than to the Old World. The "almighty dollar" had its birth in England. Nor is there special weight to be attached to the opinion that the dollar-mark ($) should be an abbreviation of "United States." It bears too strong a resemblance to the pillars of Hercules with the *plus ultra* of Spanish dollars to be sure of American origin. The tendency to curtailing much-used words has naturally led to the short term *greenbacks* for the Treasury notes printed with green ink, but worse treatment even is indicated by the puzzling word *bogus.* The most plausible explanation of this common term is, that the assumed name of a remarkably successful swindler, *Borghese*, was in course of time not only reduced to *bogus*, but finally applied to everything false and fraudulent. It spread rapidly over the whole Union, and is now one of the most familiar Americanisms.

Different branches of commerce have peculiar names. Such are *dry-goods; groceries; domestics*, so called to distinguish them from imported goods; *et hoc genus omne.* The *shop* becomes a *store;* the *store*, a *magazine* or a *manufactory;* the *bagman* or *commercial gent* is a *drummer;* the merchant who has been successful has *made his pile;* if he is unable to pay on demand he is *short*, just as a missing mail or a parcel that has not come to hand is coolly said to be *short;* the bankrupt *settles* with his creditors, which by no means suggests that he has paid their claims, but simply that he has compromised with them; a bad failure leaves him *dead broke* or *flat broke.*

Of the facility with which the slang of Old England rises to the ranks of unobjectionable words the term *going up* is an instance. It arose from the spout or tube through which the pawnbroker sends the goods he has advanced upon to an upper story. Hence, at first the phrase ran *to go up the spout*, and meant simply disappearance or destruction. Then the *spout* was deemed superfluous, and when the city of Richmond fell at the close of the Civil War the newspapers reported gravely that it had *gone up.* Among colloquial terms derived from commerce none are more frequently heard than *posting* and *posted up.* The terms arise, of course, from accounts, which when fully entered on the ledger are said to be *posted up.* As Americanisms, however, they are used to express full knowledge of any subject. A would-be farmer thus says: "I require much *posting up* (information) before I can begin," and a scholar of various learning is reputed to be *posted up* on all grave questions.

Of all trades, the trade in *liquors*, as spirituous beverages are uniformly called, has furnished the largest number of words, many of which, originally limited to slang, have made their way into orthodox speech. The drinking habit is concealed under a thousand disguises, of which *to smile* is perhaps the oddest and newest. Where many are assembled they propose to have *a smile* all around. Most frequently such an invitation is called *a treat ;* to pay for it used to be *to stand treat*, a term becoming obsolete. The custom, imperative in certain classes, is purely American, and so is the use of the word in this peculiar sense. *Groggeries* and *doggeries* may generally be traced back to Irish or English immigrants. In the cities they are often called *shades*, promising a cozy retreat safe from the light of day. *Saloons* abound in the West, while ingenuity has invented the name of *sample-rooms*, used in the large cities, and suggesting the fiction that customers enter only to try or *sample* the wines of the dealer. It is here that the *bartender* is in his glory. Among his concoctions the *mint-julep* holds the first place. The word *julep* is found in Milton's *Comus*, and means in Arabic a sweet potion, but the mixture of pounded ice with brandy, to which small branches of mint impart their aroma, is claimed by Virginia, where it speedily took the place of the old *dram.* With the various *drinks* invented by Americans came into use the *straws*—slender tubes of wheat, or even of glass—through which beverages are sucked up, or, as it is called, *imbibed.* The *tavernkeeper*—never *innkeeper*, as in England—is apt in rural districts to have not only a *bar* for his customers, but also a *tenpin alley.* The old *ninepins* (in England called *skittles*) have disappeared, since a special law forbidding the game was evaded by the addition of a tenth pin. The man who knocks over the whole number is said to make a *ten-strike.* This word, again, is used to indicate any sudden success. The man that has *struck oil*, or, in other words, has unexpectedly come upon a petroleum well, may be said to have made a *ten-strike.*

Although the once-despised American colonies have since built the fastest clipper, the first monitor, and the largest river-boat in existence, they have contributed few new sea-terms to English speech. A *battery* is the old name given in Chesapeake Bay to a heavy boat shaped not unlike a coffin, and hence also known as *coffin-boat*, used in duck-shooting. The *monitor* is an Americanism in build as in name—Capt. Ericsson's famous invention. *Raft* has gained a new meaning, being used to designate large numbers of trees and timber caught and stopped by a sandbar or some other obstruction. The first improvement upon the primitive raft was the Mississippi *flatboat*—an oblong ark with a roof slightly curved from the centre, so as to shed rain. The flatboats were loaded down to the water's edge with produce and merchandise, and, having accomplished their long voyage of several thousand miles, were broken up in New Orleans and sold as lumber. These *arks*, as they were frequently called, survive only on Western rivers, having elsewhere given way to steamboats. The *schooner* also is claimed as an American invention bearing an American name. When the first vessel was launched in 1713, a bystander is reported to have exclaimed, "How she *scoons!*" and hence the name. *Slack-water navigation* is probably an Americanism, meaning an inexpensive canal in a river, securing by means of dams and locks a permanent supply of water. The extent to which the two nautical terms *aboard* and *ahead* have extended their meaning to the ways of men on land is quite amusing. Travellers by rail are urged to *go aboard* the *cars*, as coaches are called, the conductor finally crying out, "*All aboard!*" One school-boy is in like manner *ahead* of another; American churches are *ahead* of English churches; and the press is *ahead* of all others in the world. *To go ahead*, although it may not be a genuine Americanism, is used universally, and *go-aheadativeness* hardly less.

The *railroad*, as Americans uniformly say, instead of *railway*, as in England, has brought with it a number of terms peculiar to the New World. The English "station" becomes a *dépôt*, pronounced *dee-po;* the "trucks" of the Old World are sometimes called *gondolas*, and there are *palace cars*, and even *silver palace cars!* This tendency to use high-sounding names has led to calling fine mansions *palatial residences*, and has even produced *bridal chambers* on board steamboats! The *mail-car* is a coach in which, while in motion, all the business of a first-class post-office is carried on. *Sleeping cars* owe their existence, as well as their equivocal name, to the United States, and the shortened term of *sleeper* is also an Americanism. "I'll go by *rail*" is another abbreviation, further reduced in phrases like "I'll *rail* it all day." The "luggage" of England has given way to *baggage*, and the business of the *express companies* that convey merchandise, etc. all over the country is done by means of special *express-cars*, and distinct from the *baggage-car.* The "buffer" of the Old Country is called the *bumper*, the "stoker" becomes a *fireman*, as on board ship, and the "driver" reappears as *engineer*, while the "guard" is a *conductor.* *To telescope* also has been employed to designate the calamity occurring when, owing to some mishap, cars run with their forward end into the rear of the preceding cars, as the smaller parts of the telescope glide into the larger. English "gradients" become simple *grades*, and where curves are absent people speak of *air-line roads.* The track itself furnishes new words—the *frogs*, iron plates put where two lines intersect, and resembling the frog of a horse's hoof, and *switches*, where in England trains are "shunted." The *underground* railway meant in former days the secret ways by which slaves were enabled to reach the North and to obtain their freedom. *Deadheads* is the name given to all persons, like legislators and others, who are privileged to travel free of cost. When a train of railway-carriages leaves the track it is said to be *derailed*, and if the carriages are upset, they may be *ditched* in the drainage-works running along the track.

Natural history presents few Americanisms, almost all foreign-sounding names being genuine foreigners, dating from the days when Indians, Spaniards, and Frenchmen were masters in the land. The *buffalo* was familiar to Pliny as the wild ox; then the name was given to various wild animals of large size; and finally it was bestowed upon the bison (*Americanus*). Immediately, however, the gigantic animal was so called after the Spanish *bufalo.* The word lends itself to many a compound which may be looked upon as an Americanism. The hide of the buffalo alone is called a *robe*, but where it is used as a cover it is never anything else but *buffalo* only. "I drew my *buffalo* close around me," says the half-frozen hunter. *Painter*, a corruption of "panther," is the name given to the *catamount*, a large-sized wild cat, known as *puma* in the southern part of the continent, and as *cougar*, from the French *cougouar*. An animal peculiar to the United States is the *ground-hog* of the South, known as *wood-chuck* in the North. The *partridge*, a bird not found in the United States, is a quail in Pennsylvania and the South, or a pheasant or a grouse. The American ortolan is, in the same way, a *bobolink*, called *reed-bird* on the banks of the Delaware, and *rice-bird* farther south. The *cat-bird*, so called from its imitation of a cat's voice, is a highly gifted thrush. The master of song is the *mocking-bird*, common from the Carolinas to Brazil. Even the oft-quoted *bald-headed eagle*, or *bald eagle* simply, bears but a spurious book-name. A double blunder is made in calling a bird *turkey-buzzard* that is neither a turkey nor a buzzard, but a vulture. Among birds peculiar to America, and hence bearing native names, is the *hang-bird*, as the Baltimore oriole is often called. This beautiful bird, deriving its name (*Aureolus*) from its rich orange, has become the emblem of Baltimore, as the lords of that name had liveries of the same colors as the bird, black and gold. The word *whip-poor-will*, universally curtailed to *whip-perwill*, is an adaptation rather than an imitation of the very peculiar cry of a native bird. The *humming-bird* is peculiar to the American continent, but so universally diffused that W. Gould could collect 400 species from Hudson's Bay to Patagonia. In the far West the *burrowing owl* claims our attention—a day-owl which dwells in the earth. To call a hen a *biddy* is harmless enough, but to make of it a *hebiddy* and a *chickabiddy* is a curious perversion. The catfish appears shortened as *cat* only, and the rockfish, in reality a striped bass, as *rock*. The most highly esteemed of American fish is undoubtedly the *sheepshead* (*Sparus ovis*), very appropriately so called from the resemblance of its head and teeth to those of a sheep. It is curious that the familiar *halibut* comes to its right again in some of the States, and is called *holibut*. The *rattlesnake*, so called from the rattles which form its tail and by which it gives warning, is interesting as having at one time been chosen as the national emblem. The first fleet which sailed from the Capes of Delaware in 1776 bore a yellow flag containing a rattlesnake in the act of striking, and the appropriate motto, "Don't tread on me!" It was more than a year before the unpleasant flag was replaced by the Stars and Stripes, "representing a new constellation."

The article of *tea* is a great mystery in the United States, where probably a greater variety of decoctions bearing that name are in use than in the rest of the world. *Sage tea* and *mint tea* explain themselves, but *sass tea* is made from the fragrant leaves of the sassafras-bush. *Spice tea* is a decoction of another laurel, the so-called *spice-bush*, also known as *fever-bush*. *Yaupon tea* is perhaps the best substitute yet found for real tea, furnished by the leaves of a very common ilex, and possessing the pleasant taste as well as the remarkable power of the Peruvian *maté*. *Sarsaparilla tea* is made not from the Mexican plant of that name, a smilax, but from a variety of the famous ginseng. The word *sauce*, frequently pronounced *sass*, appears in Forby as meaning "vegetables eaten with flesh-meat," but in America it covers every kind of garden-stuff, called *greens* in the South. The verb *to sass* has obtained an unenviable meaning, and serves generally to express the giving of impudent, sharp replies. The *saucy* boy is bold and defiant. The familiar *potato* is in America often called the *Irish potato*, to distinguish it from its formidable rival, the *sweet potato* (*Batatas edulis*), a staple food. From the tuber is derived the term *small potatoes*, applied with more or less humor to anything mean and petty. In the country the successful or able man is in the same way ludicrously called *some pumpkins*.

One of the most familiar weeds of the South is the *Datura*, known under the genuine American name of *Jamestown weed*, so called from Jamestown in Virginia, where it first took possession of American soil after its transfer from the West Indies. At present the plant is rarely called anything but *Jimson-weed*, or even *Jimson* simply.

The most valuable of American grasses is known as *blue grass* (*Poa compressa*), which springs up spontaneously on limestone soil. and is deemed to be the very best food for every kind of cattle. The vast regions where it remains almost an evergreen are referred to as the *blue-grass region*, a term adopted even in official language. Its only rival is the famous grass which bears the name of its first propagator, and is still called *timothy*, after Timothy Hanson. Among trees peculiar to the United States none is perhaps more graceful or more ornamental than the *tulip poplar*, often called simply a *tulip*, from its beautiful tulip-shaped blossoms. *Peach trees*, bearing fruit within three years after being planted, produce *free-stone* peaches, in which the stone lies loose, and *cling-stone* peaches, with stones firmly fixed. One of the noblest trees of America has not escaped the corrupting tendency of rustic speech, and is called an *ellum!* A beautiful variety of horse-chestnut, known only in the Western continent, is graphically called a *buckeye*, a picturesque name it received on account of the striking resemblance its nut bears to the eye of a deer. By sheer ignorance, it must be supposed, two entirely different trees bear the common name of *dogwood*—one the familiar cornel tree; the other the *poison sumac*.

Geology has had but few terms of its English nomenclature changed into Americanisms. Almost the only difference noticed by English travellers is that the American's fondness for big words, as for large proportions generally, leads him to substitute the word *rock* for *stone*, producing thus the result that a boy boasts of having thrown a quantity of *rocks* at a little bird.

Of all classes of words, however, which have contributed to the formation and continued use of Americanisms, none surpasses in number and interest the large host of good old English words which, for one reason or another, have at home sunk so low as to disappear from good society, while in America they have retained their meaning and full citizenship. Among the Americanisms of this class a goodly number owe their existence simply to the restless hurry of American life. Thus *ad*, now used in the common language of the country, is accounted for by one of the best magazines: "*Ad* means exactly as much as *advertisement*, and is two letters instead of thirteen." Others are genuine Old English words, superseded at home by new-fashioned forms, but preserved in America by the conservatism of the country. Thus, *afeard* is very frequently heard for "afraid." *Axe*, supported by great antiquity, survives with astonishing vitality in Southern speech, and strong pleas have been entered for that old word as far preferable in point of euphony to the harsh "asked." *Be* also, taking the place of "am" or "are," as constantly used in our Bibles, survives largely in New Hampshire and Massachusetts. A plea has been entered by the poet Lowell in behalf of *ben*, as uniformly used by Yankees for *been*. His brother-poet Whittier, using it with special affection, follows only the example of Sackville, Chapman, Dryden, and many more, though *bin* seems to have been the more common form. *Big*, used for "great" or "high," can hardly be called an Americanism, but the ambition of *great big* clearly arises from extravagance of speech. *Bile*, largely used for "boil," may claim the great Johnson's indorsement. It has maintained itself throughout the Union, and the *biled shirt* in the border settlements is a mark of respectability. The word *boozy*, originally a vile Gypsy word, then obtaining citizenship through the Dutch word *buysen*, to tipple, was carried across the Atlantic in Queen Elizabeth's time with many other drinking terms. *Brandywine* seems to be able to boast of ancestors in more than one line. *Buggy*, in England a light one-horse chaise hardly known in our day, means in America the most popular of all vehicles, four-wheeled, but single-seated, and with or without a top. *Cattle*, in England used promiscuously for all animals that serve for food or draught, designates in America only the bovine genus. *Chimley* is common in all parts of the Union, though the fuller form *chimbley* is perhaps even more general. *Chore*, a small task of domestic work, most frequently used in the plural as *chores*, is hardly, as Lowell humorously suggests, derived from the French *jour*, in the sense of a day's work. It comes more likely from the Anglo-Saxon word *care* or *chare*. "Clerk" is in Virginia and some other States still called, and even written, *clark*, as it was sounded when John Smith established that colony. *Clever* is one of the most cruelly ill-treated Americanisms. It has assumed two very different meanings, designating in the North a good-natured, obliging person, while at the South it means rather gifted and talented. The American pet-word *smart* has, however, largely superseded it. The English "relations," once so beautifully and strikingly called "kinsmen" and "kinswomen," have in America been transformed into *connections*—related by marriage—while *relatives* are related by common descent. *In this connection* is an American phrase justly doomed to what Sir Walter Scott's daughter called "unquestionable fire." *Coverlid* is evidently a misnomer for the diminutive *coverlet*. Mr. Lowell pleads, full of patriotism, for the American corruption *cowcumber*, instead of the orthodox "cucumber," because it approaches nearer to the sound of the French *concombre*. *Creature*, commonly used, in all parts of the South, for any animal, especially a horse, bears a curious relation to its curtailed form *critter*. When applied to men or women, the *creature* implies a certain amount of goodness, beauty, and respect or love; the *critter* is a scold, a scandal-monger, a fool, or a flirt, not entitled to special respect or affection. *To deed*, as a verb, is a genuine Americanism. A woman is pitied because she has *deeded* away all her property. This is done by *deed of trust*, a term which is exclusively used instead of the English hypothecation of landed property.

Dirt is in America very commonly used for soil, and *rag* for a piece of linen. *Dogs*, in the sense of andirons, has claims to high antiquity, and in America the use of the word has been faithfully preserved. *Dove*, the old past tense of *to dive*, oddly reappears constantly, mainly with seamen, but not unfrequently also on land. *Dress* has driven out the English "gown," which is rarely heard except among very aged people, and *driver* has very generally superseded "coachman." *To dump*, in the sense of tilting a cart and thus unloading it, is an Americanism, and open lots where "rubbish may be shot," as is said in England, are in America called *dumping-grounds*. *Dyspepsia* has long lost the special meaning it has in England, having become a generic term for every form of weakness of the digestive organs.

An *editorial* is an Americanism as far as it takes the place of the English *leader*. It has a companion in the *local*, furnished by the reporter whose special duty it is to furnish local news.

To enthuse, in the sense of filling or being filled with enthusiasm, had its birth in the South, but is now perfectly at home in the Northern States, and has found its way to England. The pleasing word *fall*, for autumn, was not born in America, as many imagine; it had simply ceased to be used in England. The practical good sense of the American has led to the more or less objectionable meaning which he gives to the word *fancy*. When Macaulay speaks of the *fancy* prices the Prussian king paid for his giant soldiers, he refers merely to their being out of proportion to the value of the men; but *fancy stocks* represent no real value and exist only on paper.

To fix may be said to be the American word of words, since there is probably no action of mind or body which is not at some time or other represented by this word. Whatever is to be made, whatever needs repair, whatever requires arrangement,—all is *fixed*. The President *fixes* his Cabinet, the mechanic his work-bench, and the seamstress her sewing-machine. And yet *fix* may mean trouble and embarrassment. The New York *Herald* speaks of Pres. Arthur "being in a fix," and a young lady hesitating between two suitors is in a "painful *fix*." *Fixings* naturally abound also, and denote wellnigh everything, from the *railway fixings* of a new branch to the *chicken fixings* of the West and the South.

The familiar word *gap* has acquired a new, purely American meaning, and denotes a pass in the mountains through which a river or a public road runs.

To get, like *to fix*, a verb used as a maid-of-all-work, may be said to have made its way from America to England and back again, thanks to its remarkable usefulness. *To get religion* may not be exactly correct, and *to get improved* hardly conveys a clear meaning; but *to get money*, at first vehemently objected to, has since received the sanction of the best English writers. Even the shortened form *got* for *gotten*, long denounced as an abominable Americanism, has now its advocates in England, and so careful a speaker as the late earl of Derby spoke of *getting on*.

A *given name* is in New England mainly a common substitute for *Christian* name. *Guess* is probably, of all words in the dictionary, the most thoroughly abused and the most passionately discussed. Quoted by almost every writer on America as one of the most obtrusive Americanisms, there is ample evidence that the word has been used in England from time immemorial in the precise sense in which the Yankee uses it now. The only difference in our day is perhaps that the English *guess* is a fair, candid supposition, while the American who *guesses* is apt to be quite sure of what he professes to doubt. As he only *calculates* when he has already solved his problem, so he *guesses* after having made sure of his fact. "*I guess* I can" means, from his lips, "I am sure I can." To *happen in* is a phrase which in this country has acquired the new sense of "to *happen* to come in." The tendency to establish perfect social equality, which, as before mentioned, has led to the abolition of the term *master*, has in like manner done away with the corresponding *servant*. In this aspect the word *help* has come to answer to the word *boss*. This is, of course, only an extension of the original word from an instrument to a person. The Irish laborer condescends to become *a hired man*, but never a man-servant.

Herb is the term exclusively used for the English "simples," and *herbs* are responsible for the *herb-doctors*, who abound in a country where the almost unrestrained license to practise and the readiness to entrust health and life to quacks and adventurers are equally amazing. *Humbug*, long denounced as a bastard word, is mentioned by Halliwell as meaning a bugbear, in which sense Lord Chesterfield also uses it frequently in his letters. The verb *to interview* is not to be laid to our charge; Hall's *Chronicle* (1572) has it.

The term *job*, originally a cant word, has made its way first into political language, and thence into the idioms generally; nor has England been able to keep out the obnoxious term. *Lick*, as the name of a place, is in its very nature an Americanism; it denotes a place where salt-springs have long attracted buffalo and deer.

Mad, in the sense of angry and as a substitute for the English *wild*, is one of the many innocent sufferers under criticism. Yet it has been recognized as excellent old English. Capt. John Smith says, "This made him *halfe madde*." Even the familiar phrase, *like mad*, has old and high authority. Pepys writes

(June 13, 1663), "A coachman that drove *like mad.*" *To mail*, as applied to letters and newspapers, has partly superseded the English "to post."

Notion, in the sense of intention, is probably an Americanism, and is by no means confined, as formerly, to colloquial language. In the plural it denotes, oddly enough, every variety of small wares, which, as they belong to a special section, become *Yankee notions*, *Boston notions*, etc. Even a *dealer in notions* has become a regular mercantile term. Nor is it a new word, for F. Bentley says (1703), "He may coin new *notions* of his own." *Pants* are often used for *pantaloons* in American conversation, as the latter have taken the place of the English *trousers.* The word is, however, still condemned by purists. *Pitcher* is a word by many good judges declared to be the shibboleth of the American. "If a man asks for the milk-jug," says R. G. White, "be sure that he is British bred; if for the milk-*pitcher*, be equally sure that he is American." *Poke*, the oldest form of the French word *poche*, still survives by the side of modern *pocket*. "To buy a pig in a *poke*" is familiar to the American as to the Englishman, and shows how obsolete words survive in proverbial phrases. As a verb, however, *poke* cannot claim great antiquity. *To poke fun* is a new phrase, the origin of which is not quite clear.

To raise, applied in England only to vegetables and animals, is used in America also in reference to men. Nothing is more common than the question, "Where were you *raised?*" and the answer, "I was *raised* in Ohio." And yet this also is not an Americanism, the word being used in this sense in Lord Herbert of Cherbury's *Memoirs* (1645). "They were," he says, "his servants, and *raised* by him." *Reckon* is the term used at the South which corresponds to *calculate* at the North. The same use was, however, made of *reckoning* by many English writers, and it is found in the Authorized Version of the Bible. *To ride*, which in England is used only for riding on horseback, has in the United States retained its old, more general, meaning. Everybody in America *rides* in a coach or a buggy, and even in the cars. *Right*, in the sense of *very*, often condemned as an unpardonable provincialism, is as old as the English language. In Halliwell's edition of the *Voiage of Sir John Maundeville* we find, "And there *righte* nighe is the tomb." *Right-away*, used for *straightway*, excited the wrath of Dickens on his first visit to Boston. Now the phrase is heard all over the Union, and has made its way to England also. Very expressive of American haste and hurry is the comparatively modern use of *to run*, in the sense of to manage or to keep, when applied to any kind of business, from a gigantic hotel to a petty grocery. "Who *runs* this business now?" means, "Who is the manager?"

Safe, a box or a cupboard in which the housekeeper stores her supplies, has superseded the familiar English *larder*. Less pardonable is the use of the word *casket*, which threatens to become a substitute for *coffin*. One of the few French words which have become naturalized in American speech is the *chantier*, thoroughly adopted in the shape of *shanty*. Originally used by voyageurs and Canadian immigrants, it is universally employed to designate a slight wooden shed or shelter. *Sick*, in England used only for nausea, is in America applied to any kind of indisposition. *Slip* has acquired several new meanings in its new home. It means an opening between two wharves or in a dock; hence many localities in the city of New York bear such names as *Peck Slip*, etc. In New England it also designates a narrow pew in a church, somewhat resembling a slip on the wharves; if the *slip* have a door, it becomes a *pew*. The use of the word for a cutting from a newspaper is not unknown in England, but it is far more general in America. *Stocking-feet*, a term long denounced by English critics, cannot be so great a barbarism, since Thackeray uses it. *Sun-down*, found in early English writers, and *sun-up*, formed analogously, but probably an Americanism, are constantly used. *Talented*, a form strongly denounced by Coleridge, is correctly formed after the manner of *spirited* and *gifted*, and eminently useful; it has made its way to England, where it is now used by the best and most fastidious writers. The "vile and barbarous vocable," as Coleridge called it, has justified its authors. *Telegram* is an undoubted Americanism, which can be traced to its first appearance in the Albany *Journal* of April 6, 1852, formed in analogy with *epigram* and *monogram.* Its brevity made it speedily supersede the *telegraphic despatch* in use before; and the question is now discussed whether *cablegram* can be allowed to follow the example. However useful the latter may appear, it is an unwarrantable bastard, and even the two verbs *to wire* and *to cable*, which have sprung into existence recently, seem to be more pardonable.

It is not without its interest to see how ill-made Americanisms are frequently short-lived. Such was the verb *to transpire*, once used all over the Union for everything that had happened. An event of importance was no longer said to have occurred, but to have *transpired*. In our day the use of *transpire* for "happen" or "occur" has become the exception. *Ugly*, as denoting a want of beauty, has been replaced by *plain;* but why the good old English word *comely* also should have been banished, giving way to "pretty," "handsome," etc., is not quite clear. At the North *ugly* has sunk to the kindred meaning of bad or ill-natured. *To ventilate*, as applied to persons, is an objectionable abuse of a picturesque word which in its legitimate meaning has forced its way from the French into German and English. *Vest* denotes the short sleeveless garment worn under the coat, while *waistcoat* is restricted, very properly, to a garment worn immediately on the body, and hence actually a *waistcoat*. The American's favorite and lifelong occupation, in the eyes of foreigners, is of course to *whittle*, a word evidently derived from the Scotch *whittle*, a clasp-knife. The word is a diminutive, and comes from the verb *to whet*. So far from being an Americanism even in meaning, we find Horace Walpole writing (1746), "Then we have *whittled* down our loss extremely." *To wilt* appears more of a genuine Americanism, denoting the stage in the life of a flower between drooping and withering. The imaginative phrase, "He *wilted* right down," is an expression peculiar to the New World.

It will be seen that the number of true Americanisms is, after all, very small, and many of these even will, upon careful investigation, be found to be either revivals of obsolete words or imitations of well-known terms. New habits and new occupations do not always call for new expressions. It is only when special importance is attached to a custom, as in the case of *Forefathers' Day*, the 22d of December, on which the Puritans landed at Plymouth, or when the usefulness of a new form or a new word makes itself felt instantly, as in *mailable* or *telegram*, that an addition can be made, and is made, to the essential parts of a language. Cant and slang, on the other hand, flourish with startling vigor in a land which welcomes the new-comer from every part of the earth, and in its republican freedom encourages the free use of words regardless of taste or propriety. Much of this disappears as soon as society organizes into permanent forms, and words and manners alike reflect the powerful influence of law and order. This is manifest already in different parts of the Union. While in the Eastern States life begins more and more to assume European ways and forms, the great West contributes still its characteristic thoughts, and names them with perfect independence.

A far greater danger, however, threatens English speech in the columns of the low-toned newspaper, which, instead of acting as a monitor and well-meaning critic, becomes a flatterer of the populace and a panderer to its lowest vices. Owing to this pernicious influence, colloquial inelegancies become the rule and downright vulgarisms deface the language.

The day of Americanisms, however, is wellnigh gone. With every new steamer built to cross the Atlantic, with every new cable binding the Old and the New World, with every change of politics in Great Britain, the two sister-nations are not only more closely bound to each other, but proceed to act more fully in unison. The more they come to be alike in public and in home life, in their ways of thinking and of feeling, the more the language also, that most faithful witness of a nation's life, will become one and undivided, till our grand old mother-tongue will be the same all over the world, thus forming the strongest bond that binds the nations of the world in love and unity to each other. (S. D. V.)

AMERICANIST, a person interested in the antiquities of the American continent. The name, which is new, has grown out of certain congresses which have been held for the purpose of inciting to the study of American archæology. The first of these congresses was held at Nancy in France in 1875. So much interest was displayed that there was a second session, at Luxemburg, in 1877, presided over by the king of Holland. In 1879 they met, with no abatement of enthusiasm, at Brussels, under the patronage of the king of the Belgians. The most important perhaps of these conventions was held at Madrid in Sept., 1881. The interest had become more general, and the occasion was noticed by scholars all over the world. The king of Spain presided, and Spanish ministers and distinguished scientists took part in the discussions. At the *séances* were about forty eminent foreigners, most of whom were delegated by their several Governments. The object of the Americanist is to explore the great field of American archæology, and to let science take the place of hypothesis. The fantastic theories about the Atlantides are subjected to actual exploration: deep-sea soundings are resorted to to reproduce a sunken continent. Geology brings its aid by the presentation of fossils and extinct animal species. The pre-Columbian history presents a rich field, in which rare returns will be found; the claims to discovery made in behalf of the Phœnicians, the Jews, the Welsh, and the Northmen are to be settled; and every day affords some new material in the form of monuments, symbolic inscriptions, etc. Germany leads in the movement, in proof of which stands the extremely interesting American Museum at Berlin. In addition to the papers read at Madrid, there was an exhibition of American antiquities and cognate objects of rare value. Among them were the original concessions made by the crown of Castile to Columbus, and a number of the books of the Great Admiral, annotated by his own hand long before 1492, showing his convictions and his hopes of Western discoveries. It is worth mentioning that there are in the *Bibliotheca Columbina* at Seville a *Tractatus de Imagine Mundi* (by Pierre d'Ailly), which Columbus took with him on his voyage of discovery, and a MS. tract written by him when in prison to prove that his discovery was predicted in the Bible. The exhibition also contained the bull of Pope Alexander VI., dividing the new-found world between the Portuguese and the Castilians; a paper expressing the concurrent opinions of the principal navigators in favor of Sebastian del Cano, the companion of Magellan; many rare early pictures belonging to the duke of Ossuna, presenting with pre-Raphaelitic fidelity the episodes of the Conquest; several of the Aymara mummies (of the Peruvian Indians), shrunken, but distinct in their lineaments; vases and statuettes like those of early Egypt. One of the most curious objects was an early portrait of Columbus, which was discovered to have been painted over with the encumbrances of a curled wig and a fantastic costume trimmed with furs; when these were skilfully removed he was disclosed in the simple and becoming dress of a mariner of the fifteenth century; and in one corner was disclosed the inscription *Columb. Lygur* [for *Ligur*] *novi orbis reptor* [for *repertor*]. In addition to this interesting exhibition, there was also a display of American flora at the Jardin des Plantes. The last meeting of the congress took place in 1883 at Copenhagen, the scholars of which have already been working in this field; and one of them, Carl Christian Rafn, gave to the world a collection of sagas presenting the claims of the Northmen to an original discovery in his *Antiquitates Americanæ seu Scriptores Septentrionales Rerum ante-Columbianarum in America* (1838–45). (H. C.)

See Vol. I. p. 630 Am. ed. (p. 718 Edin. ed.).

AMERICAN LITERATURE. The international critic is almost as deserving of pity as is the international novelist. If he pleases one country, he offends the other, in which his fault-finding is thought to be captiousness; his praise, condescension. Fortunately, however, criticism which is nothing more than the expression of the writer's likes and dislikes is fading away, and is succeeded by the careful study of the organic growth of literature. The mere statement of this new aim should clear away many misconceptions, for it implies that the critic expects to find coherence in the literature he is studying, and its relation to the current thought of the time. More than this, he does not look for any mysterious, inexplicable quality akin to a special creation. Such a quality is Americanism in literature, for which foreign critics have long sought with but little success. They have imagined that when our writers put pen to paper they would say what had never been thought before—that they would be inspired by something that should as certainly excel the sublimity of Dante or Milton as Niagara roars louder than the more modest cataracts of civilized Europe, or which should be more comprehensive than anything done elsewhere as the prairies are broader than a lawn, or the Mississippi than the Avon, for instance. Yet, since intellectual force stands in no direct ratio to the area of a country, we have disappointed the world: what those who have studied us have discovered is a strenuous effort to hide whatever Americanism there may be lurking within us, and much misdirected effort to cut our coats according to the patterns most admired in London.

The estimable Mrs. Bradstreet, who published her poems in 1650, abounds with the conceits which were admired all over Europe at one time or another in the seventeenth century; Joel Barlow's *Columbiad* is written in the only measure which a fourth-rate verse-writer would have dared to use eighty years ago; and at the present time we have numerous imitators of Tennyson and of the more modern neo-romantic poets. The mediocre American writers remind one of the multitudinous German authors of the last century before Lessing, when that country was bound hard and fast by the chains of pseudo-classicism, and the only desire seemed to be to do ill what English and French writers did well. Both in Germany at that time and among the inferior American authors of more recent date we see the same intense interest in literature, most earnest effort, and similar meagre results. Teutonism is the last quality one finds in, say, Besser's poems, as Americanism is not to be detected in Mrs. Sigourney's pallid reflection of Mrs. Hemans.

We see, too, that the more important American writers have always breathed the air of their time. Franklin could no more avoid carrying out Locke's principles than could Addison. An American is not exempt from the universal law that thought is a thing of gradual growth, of advance step by step. Cooper wrote novels resembling Scott's, not from caprice, but in obedience to the charm of the new spirit which was gathering strength throughout the last century to appear almost simultaneously in France, England, and Germany: the wave passed over Europe; America could not be unconscious of it. It is a great mistake to suppose that Emerson was an imitator of Carlyle: both men felt the importance of the individual in modern life; both expressed what had long been one of the animating principles of society, as was shown by the new interest in paupers, convicts, and slaves. Bentham's philosophy, which rested on the importance of individuals rather than on that of an abstract community, was another expression of the same movement. No strangeness of language keeps out the great aspirations of the whole race from any nation. Hungarians and Russians wrote Byronic verse.

Americanism need not be defined as miraculous originality. The sequence of thought rules in this country as elsewhere, and intellectual progress is, the world through, the result of assertion, contradiction, repetition, denial, and long discussion: the national characteristics are rather different methods of treating questions familiar to all civilized men. What human being has ever created a thought? Yet Americans alone are continually condemned for not doing this impossible thing. One is complimented, however, by being expected to do the impossible.

No American, certainly, can read Emerson without perceiving the long-sought Americanism of his way of writing. Any one who has known twelve New England farmers has known six or eight men who shared Emerson's imperturbability and apt, homely wit. In his *English Traits* he says that Landor pestered him with Southey, and he asks, "But who is Southey?" Time has been sufficiently answering this question, which demanded no verbal reply, yet there are critics across the sea who have taken superfluous pains to tell us who Southey was. Another national quality which Emerson possessed was his unconventionality. In one form this shows itself among our fellow-countrymen as what is called irreverence. The whole theory of American life is based on opposition to aristocratic principles. So far as is possible, the tendency of the country is to break with tradition. A bad effect of this is plainly visible in the way in which the accumulated wisdom of ages is ignored by whimsical politicians and demagogues, and a bad effect of the opposite tendency is to be noticed in the few, generally unsuccessful, attempts of men of letters to make themselves over again after European models. No important writer has so thoroughly followed the native disposition to be overawed by nothing as has Emerson, and none has had more influence. He has been read, while but little attention has been given to the minor writers who have struggled hard to follow the current laws. No one stops to hear the last, faintest sounds of an echo. Emerson's poetry is an earnest reaction from formal prettiness and exactness. Whereas many of his contemporaries remind one of the faultless and meritless Scotch imitators of Pope who abounded in the last century, he has his own rhythm and form of verse. When the world is cloyed with the present copious precision it may be that his verse will no longer be called awkward, and possibly in the remote future the fact that a poet writes only when he has something to say, and stops when he has said it, will not be looked on as a fault.

We see the same reticence in Emerson's prose. He has been criticised for having no complete, coherent system, as if any system could be complete. He had, however, something better than this—absolute honesty, and the incapacity of saying anything beyond what he had himself tested. He was no more imposed upon by his own theories than by those of any one else. Carlyle finally became so hungry for the right of assertion, of wilfulness, that the more brutal quality, wherever it might appear, was holy in his eyes. Emerson solved nothing by general principles. He put to every question the one test which all honest men put to life: What is it to me? And his answers were often unconventional, for there is nothing more unconventional than the truth. We notice, of course, that his work is marked by the characteristics of his time: we have seen that this was inevitable; but his mysticism will not mar his importance, any more than is the figure of Montaigne blurred by the frill of Latin quotations which he used after the fashion of his time. After all, absolute honesty is as rare in literature as it is in active life.

Emerson's writings, then, are the most important contributions of this country to literature, not only on account of the rare quality of his genius, but because his work is most distinctly stamped by national traits. The appeal of foreign and home-born critics for patriotism in literature had produced an artificial variety of Americanism which could give no lasting satisfaction. Irving's ingenious fancy and graceful style were able to give immortality to the pseudo-antiquities of the Hudson River, and Captain Kidd received a promotion which was justified only by the total lack of competitors. Too often, however, we find that form of Americanism which consists in striking out *nightingale* and putting in its place *mocking-bird*, and letting *wigwam* be printed instead of *abbey*; everything else runs as in the familiar grooves. Griswold's volumes form a huge tumulus of verse of this sort.

To ask nothing from America but Americanism would be unwise. The work of the world is more important than the distinctive qualities of any nation, and it is perhaps worth our while to consider some contributions to literature which are not marked by any special flavor of the soil, and are yet of importance. First among these may be mentioned Mr. Francis Parkman's histories. These interesting volumes tell the story of the French colonies in America with admirable thoroughness and picturesqueness. Not only do they describe an interesting series of events; they serve to throw a most important light on the history of France by the comparison that is made between the English and French systems of colonization, between the supervising care of a paternal government and the vigorous independence of natural growth. The volumes form, too, an interesting contribution to English history, illustrating as they do the way in which the ideas and principles of the mother-country were developed in a new land. The notion of the coherence of different countries which is thus appearing in what we may call the scientific part of literature will gradually make itself felt in other departments of thought.

Within a few years there has been a noticeable increase in the number of the students of American history, who have generally adopted the best methods for the study of the problems awaiting them. The antiquities of the country are investigated with care; attention is given to the collection and sifting of Indian legends; the documentary history of the colonies is receiving thorough examination; and the result will be a more precise account of the growth of the country than any now existing.

Whatever there may be in the life of the present that is likely to be overlooked by the historian now forms the favorite material of the novelist, who holds the mirror up to nature with great care and so as to reflect the every-day life of every-day people. Such, at least, is the description of the novels that find the greatest number of readers in this country. The realism which inspires, too, the new historical work is not peculiar to America; it marks much of the fiction published in England, France, Russia, and Italy. In this country, however, there is a profound substratum of dull but popular novels, without literary merit, which do but reflect the monotony of vacuous lives. Fortunately, however, there are a few novelists who genuinely deserve their fame. The most eminent of these are Mr. W. D. Howells and Mr. Henry James. Mr. Howells's work is marked by very agreeable humor, and the characters which he treats of are drawn with great delicacy. These are the qualities that first strike the reader, and they form an important part of a novelist's equipment. Of even more importance is the way in which the writer perceives what his age is saying to him, and expresses its aspirations, interests, and hopes. Even when romanticism made a ruined abbey almost as essential a part of a novel as an Italian lake is of a drop-curtain, Hawthorne won a very lofty rank with but a handful of antiquities and a copious imagination. So, now, the novelist does not need archbishops or noblemen, whose sole merit is their rank, if he has the power of describing a simple human being. Life in this country is undoubtedly colorless. There is no one vast, controlling enthusiasm; there is no lofty ideal which inspires a number of people; the main interests of most of us lie in social success or simply in the accumulation of enough money on which to live comfortably, or of more than we need. Social laws are certainly not burdensome; life is easy in a democracy. There is but little zeal for learning or for making the world over anew, and the novelist has none of the adventitious aids of a rigid social system or of an eager fervor in behalf of some theory to make his heroes and heroines interesting. The monotony of civilization is more useful in preparing statistics for the compiler than in supplying tragic setting for the novelist. General prosperity is more gratifying to the father of a family than it is to his daughter, who is sitting in the north room trying to draw a picture of life and its agonies. Yet there are young people, and they, if life is too easy, will make misery for themselves; and these are the usual subjects of the novelist. Mr. Howells has chosen them for the main characters of his novel, and he has picked out the idyllic incidents of the life that he has seen about him for the setting of their story. He puts before us not the rank materialism which forms a prominent part of the life of to-day, but rather the reaction against it which lurks in out-of-the-way places among quiet people. What he sees is the innocence, the unconventionality, of a great part of the people of the country; and no one has better described these attractive qualities. His heroines, young unmarried girls, he has drawn with especial delicacy; and indeed the American girl has within a few years become one of the main characters of modern fiction. French and English writers have also undertaken to draw her, while her future husband, for whom she will wear out her life in struggling with inefficient and fickle servants and pert children, is left to the obscurity of his office, into which the light of modern culture never breaks. Native observers have undoubtedly better opportunities of knowing this new addition to the scanty list of the *dramatis personæ* of fiction; and they have not exhausted the subject. Mr. Howells draws her with the charm of her innocence, yet with a precise realism. Indeed, he is a thorough realist, and if the life he has to describe is dull and colorless, he draws it with all its vagueness of tint, lightening this with a delicate and abundant humor.

Mr. James is inclined to leave us face to face with the monotony of our lives, and to write about those favored ones whose joys and interests may be compared with the joys and interests of Europe. That is the background on which his Americans are seen. He recognizes the differences that separate the New World and the Old, and he draws accomplished Europeans, languidly refined Americans, and the indomitable American girl with unusual cleverness. This is far from being a full description of his work. It would be hard to name a living writer of English with more literary art than he possesses, or one who can draw a character so vividly with a few keen touches. He sees the obvious faults of some of his fellow-countrymen, and possibly his amusing comments on certain apparent absurdities in American manners have aroused more wrath than would more serious condemnation of the faults that really threaten the country. There are few living who would not prefer the accusation of bad principles to that of having bad manners.

What we notice in Mr. James's work is the happy combination of continental grace with a certain English thoroughness. There are traces of Tourguéneff in his work; there are passages which no English-speaking person could have written without familiarity with Flaubert and Mérimée. And, if we are not mistaken, it is by the amalgamation of what is best in the literature of modern times that American writers have their main hope of success. There must be amalgamation, not the mere accumulation of foreign objects; raw eclecticism is hopeless. Yet, just as the waves of immigration are producing a new race in this country, the various currents of thought may well be seized here and put to their best use. It would be idle to urge that this course would be unpatriotic—that the amalgamation of thought would produce a hybrid: there is no country that is not influenced by its neighbors, as there is no race free from foreign admixture. In fiction, however, we are still far from any such condition as this, and it is doubtless a healthy instinct that keeps the vast number of novelists busy with the themes they best know.

The two novelists just mentioned have undoubtedly this sign of merit, that they are frequently imitated. Moreover, the general movement of the time towards realism in literature, parallel with which is the general interest in science, demands of American writers that they describe what they know. Cooper, under the inspiration of the picturesque romanticism of which Scott was the most eminent representative, filled the unknown forests with eloquent and chivalrous Indians and covered the seas with fearless sailors. Hawthorne, as a later romantic writer, studied the intimate history of the human heart under exceptional circumstances, turning his wonderful pen to the description of morbid exceptional sufferings of plain-seeming people. Now in Russia, France, Italy, Spain, and to some extent in England and Germany, writers are learning the impressiveness and solemn significance of every-day life, which has hitherto been regarded as an accumulation of amusing incidents or as too commonplace for careful study. There is a unity in all the civilized countries that resembles the likeness between all the languages of the Aryan family. This identity has existed ever since the darkest days of the Middle Ages; similar political questions have arisen or are yet to arise in the different countries; the intellectual life knows the same indifference to geographical boundaries; the wide seas may delay, but they cannot protect us from our own attempts to solve the same problems. The present interest that shows itself in this country in realism is then part of the widespread development of literature, of which fiction is the most sensitive form, because at present it most fully expresses our feelings.

Yet, as every country has its own language, there is a national difference that modifies political methods and literary movements. Just as some particular form of government seems best fitted for each nation, there is in each one moment when its literature appears most thoroughly to express its real emotions and interests. Thus Dante, the greatest poet of Italy, belongs to the expiring Middle Ages; Shakespeare belongs to the culminating point of England under Elizabeth; the classic drama of France belonged to its period of maximum greatness; then Germany, under Goethe and Schiller, expressed the significance of the early romantic movement. The significance of America in politics is this, that it is a democracy. It will have its full importance in literature when this democracy finds expression of its hopes, fears, emotions, and interests in printed books. What gives American humor real value is the fact that it does express the national indifference to many conventions, and thus paves the way for a truly national literature which shall yet belong to the literature of the civilized world.

Outside of imaginative literature there await the worker the comprehension and application of what is called the historical method, which, to put it briefly, is the study of the actual sequence of phenomena with continual reference to the antecedent causes. In Germany this has been for many years the prevailing way of working; it inspires the younger generation of French students, while in England it is less common. In the natural sciences no other method is fruitful, and the more widely those are studied the more general will be the perception of the fertility of a method that is slowly but surely spreading into every department of human thought—from chemistry, for instance, to the writing of novels. It is equally fruitful in zoology and in all forms of history, whether of politics, art. or literature. The æsthetic method, which is but the expression of likes and dislikes, must yield before it, as much as the habit of writing history with the intention of fostering one-sided political prejudices or the entomological study of only the insects that are pleasing to the eye. The sooner Americans recognize the magnitude of the change in the way of regarding phenomena, the surer will be their advance to a position of importance. (T. S. P.)

The period since the close of the Civil War has been one of great productiveness in the American literary field, and this shows (1880-83) an increasing rather than a diminishing tendency. To record even the name of every writer who has been thought worthy of favorable notice by competent critics would overtask the present undertaking. We shall here simply mention some recent notable contributors to the rapidly-increasing volume of American literature. It should be remarked, in passing, that the importance of the monthly and other magazines and reviews as vehicles for the first publication of all varieties of writing, from the lightest to the most serious, has wonderfully developed within a decade, and the success of those periodicals which employ the arts of illustration is especially notable. And while the greater part of magazine-writing has been of a quality to engage chiefly the attention of desultory and uncritical readers, and has therefore been ephemeral and valueless as literature, there is now apparent in it a decided development in the direction of greater thoroughness, sounder scientific method, and a more acute and delicate art. This is especially the case as to fiction and historical and biographical studies; it is less true in some other departments.

The following exhibits, under the several general headings, a concise view of recent American literature:

History.—The veteran historian George Bancroft has revised his *History of the United States*, which brought the narrative only to the close of the Revolutionary War, and has added two volumes discussing with the same minuteness of detail the formation of the Federal Constitution. James Schouler has issued two volumes of a proposed series describing the career of the United States under the Constitution; though disclosing a decided partisan bias, they present spirited sketches of the political changes from 1793 to 1817. J. B. McMaster, designing to write the *History of the American People from 1783 to 1861*, in five volumes, has issued the first, which treats with great fulness the social life of the closing years of the eighteenth century. A. S. Bolles's *Financial History*, taking a wider range than is indicated by its title, treats of a variety of topics affecting the internal conditions and external relations of the country. W. C. Bryant gave his name, in association with the labors of Sidney Howard Gay, to the preparation of a *Popular History of the United States*, in four volumes. T. W. Higginson has issued a *Young Folks' History* of merit.

The causes and events of the Civil War have been recorded by a number of writers, among whom may be mentioned Horace Greeley (*American Conflict*), J. W. Draper (*American Civil War*), William Swinton (*Twelve Decisive Battles* and *Army of the Potomac*). Other authors have treated of single campaigns or events, and a series of works, issued in New York, and prepared by different military men, mostly participants in the conflict, covers the whole period of the war. The Southern or Confederate view has been set forth in works by Alexander H. Stephens, Jefferson Davis, E. A. Pollard, and others.

The period has been especially marked by the production of many careful studies of the earlier history of the country, for which complete material has but recently become available through the collections made by the historical societies and in the public and private libraries. Among the works relating to the Colonial and Revolutionary periods there are, besides Francis Parkman's histories, already noticed, J. G. Palfrey's valuable *History of New England*, Henry Cabot Lodge's *American Colonies*, R. Frothingham's *Rise of the Republic*, and Carrington's *Battles of the American Revolution*. Special events have been treated by C. H. Jones (*Conquest of Canada*), Lyman Draper, J. Watts De Peyster, and others. J. G. Shea, E. B. O'Callahan, J. Hammond Trumbull, Edward D. Neill, C. W. Butterfield, and others have carefully edited original documents relating to American history, and have also furnished valuable essays and studies relating to particular periods, events, and localities. Benson J. Lossing has added to his numerous works a *Field-Book of the War of 1812* and other popular histories. Henry Adams has written a historical review of *New England Federalism*, and Henry Wilson (Senator and Vice-President) an elaborate study, in three volumes, of *The Rise and Fall of the Slave-Power in America*. George W. Williams has published a *History of the Negro Race in America*, and George E. Ellis a volume on *The Red Man and the White*.—In archæological research the works of Dr. D. G. Brinton and C. C. Jones, Jr., are notable, and L. H. Morgan's *Ancient Society* is the result of labors commenced in the same field, but more widely extended. A remarkable undertaking is the series of histories projected by Hubert H. Bancroft, of which five volumes relating to the *Native Races of the Pacific Coast of America*, and two on *Spanish America*, have been issued. The treatment of the Indians within the United States by the Government and the people has drawn out numerous authors, including Mrs. H. H. Jackson ("H. H."), F. A. Walker, Lieut.-Col. E. S. Otis, G. W. Manypenny, O. B. Meacham, T. H. Tibbles, and others. Gen. O. O. Howard has written an account of his *Campaign against Chief Joseph*, and Gen. G. A. Custer of his *Life on the Plains*.—Many notable works of local history have been issued, some of them making important additions to the stock of sociological and historical knowledge. Among these may be named the *Memorial History of Boston*, prepared by several writers under the direction of Justin Winsor, and Martha J. Lamb's *History of New York City*. Thompson Westcott has contributed to the history of Philadelphia.—In the field of foreign history nothing so notable as the works of Prescott and Motley has been done, but Charles E. Gayarré, the historian of Louisiana, has published a supplement to the former's incomplete work on Philip II. of Spain; Dr. Samuel Eliot has issued part of his proposed *History of Constitutional Liberty;* Henry Coppée, a valuable history of the *Conquest of Spain by the Arab-Moors;* G. M. Towle, a *History of Henry V. of England;* C. A. Washburn, a *History of Paraguay;* Henry C. Lea, some learned studies of certain features of mediæval life; Charles J. Stillé, a volume of lectures on the history of Europe in the Middle Ages.—Much has been added to the store of historical knowledge by careful works of biography. Among these must be mentioned James Parton's lives of Thomas Jefferson and of Voltaire; George W. Greene's life of his grandfather, Gen. Nathaniel Greene; the biography of Timothy Pickering, begun by his son and completed by C. W. Upham; Henry Adams's life of Albert Gallatin; the *Papers* of Gen. Arthur St. Clair, with biographical additions by William Henry Smith; Adam Badeau's military life of Gen. Grant; Van Horne's life of Gen. George H. Thomas; John Esten Cooke's life of Gen. Robert E. Lee; P. C. Headley's life of Admiral Farragut; a memoir of Admiral Dahlgren by his widow. John Bigelow has brought to light the correct version of the *Autobiography* of Benjamin Franklin; J. F. Meline has discussed the vexed question of Mary Queen of Scots. A series of lives of "American Statesmen" has been prepared by John T. Morse, Jr., Henry Cabot Lodge, Henry Adams, Pres. Daniel C. Gilman, and others. Henry Flanders has published *Lives of the Chief Justices of the U. S. Supreme Court*.—In autobiography an important work is the *Memoirs* of Gen. W. T. Sherman. Under the title *Annals of the American Pulpit*, W. B. Sprague has issued in several volumes biographical sketches of the most eminent ministers of the various evangelical denominations. Many separate biographies of other leaders of public opinion have been issued. John Weiss and O. B. Frothingham have published memorials of Theodore Parker; Bishop E. A. de Schweinitz has published a valuable *Life of Zeisberger*, the Moravian apostle to the Indians; and Parke Godwin a life of his father-in-law, William Cullen Bryant.

Constitutional and Legal Writers.—The theoretical exposition of the American system of government as given in the *Federalist*, and its practical development by successive statesmen and jurists, seem to have sufficed till the Civil War again turned the attention of thinkers to its fundamental principles. The last work of the distinguished Catholic philosopher O. A. Brownson was on the *American Republic*, and J. C. Hurd independently arrived at similar conclusions in his *Theory of our National Existence*, while Dr. Elisha Mulford takes a different view in his profound treatise on *The Nation*. G. H. Yeaman also has published a *Study of Government*. Judge T. M. Cooley has discussed *Constitutional Limitations*, and Judge J. A. Jameson *The Constitutional Convention*. Pres. Woolsey has written a treatise on *Political Science* (1878), as well as a work on *Divorce and Divorce Legislation* (1869). Francis Wharton has discussed *The Conflict of Laws*, and O. W. Holmes, Jr., in his *Common Law* has applied the modern scientific method to an interesting subject. Numerous professional treatises have been produced in every department of law which cannot be considered as belonging to literature. Popular books on American government have been written by J. Alden, E. O. Haven, and Charles Nordhoff. Herbert S. Adams has made very interesting studies on the early history and European relations of American institutions.

Political Economy.—The literature of this department has been abundant, because of the direct bearing of this science upon practical questions of government, but for the same reason much of it has been in transitory and perishable forms. Henry C. Carey was the acknowledged chief of the *Protectionist* or *Nationalist school*; among those who have contributed to its literature are Francis A. Bowen, E. Peshine Smith, Dr. William Elder, George B. Dixwell, Prof. W. D. Wilson, Robert P. Porter, R. E. Thompson, Dr. J. M. Gregory, W. D. Kelley, Van Buren Denslow, Henry Hall, F. B. Hawley, G. P. Stebbings, David H. Mason. The *Free-Trade school* includes the late Amasa Walker, A. L. Perry, L. H. Atwater, W. G. Sumner, John Bascom, W. M. Grosvenor (*Does Protection Protect?*), J. M. Sturtevant, Gamaliel Bradford, Edward Atkinson, David A. Wells. To the new *Historical school* belong Prof. C. D. Dunbar, F. A. Walker, Albert S. Bolles, William B. Weeden (*Social Law of Labor*).—In the controversy on the proper character of money (from 1873 to 1880) the common teachings of the economists found supporters in the late Pres. Garfield, F. A. Bowen, F. A. Walker, James Gallatin, A. D. White, John E. Williams, Simon Newcomb, John Sherman, George S. Coe, W. G. Sumner, Alexander Del Mar. The views of the Greenback party were advocated by Peter Cooper, Henry C. Baird, F. E. Spinner, J. W. Schuckers. The remonetization of silver was advocated by Hon. John P. Jones, H. C. Carey, T. O. Howe, F. A. Walker. The controversy on Socialism has enlisted the pens of R. J. Wright (*Principia*), Henry George (*Progress and Poverty*), Pres. Noah Porter, Prof. Roswell D. Hitchcock, and others.

Religious and Theological Writers.—No department of American literature is more copious than that which pertains directly or indirectly to religion. The various systems of belief, being untrammelled by the civil government, have had an open field in which to show their capacity to attract and direct the thoughts of men. We append a list of the prominent writers in the different religious denominations.

The *Hebrews* are represented in American literature by Isaac Leeser, I. M. Wise, S. Morais, David Einhorn.

Among *Roman Catholic* authors we note, of the higher clergy, Archbishop James Gibbons (*Faith of our Fathers*), Bishops J. L. Spalding, F. S. Chatard, S. V. Ryan, B. J. McQuaid, P. R. Kendrick, T. A. Becker. Among the other clergy are Fathers T. S. Preston, I. T. Hecker, A. F. Hewit, A. J. Thébaud (*Gentilism, or Religion previous to Christianity*), R. H. Clarke (*Deceased Bishops in U. S.*). Among laymen Orestes A. Brownson long occupied an unique place as a philosophic expounder and defender of Roman Catholic doctrines and opinions. J. Gilmary Shea and J. G. R. Hassard have published historical and biographical sketches connected with the Church.

Among the *Protestant Episcopalian* church historians are Rev. Dr. E. E. Beardsley, Bishop W. Stevens Perry, Rev. C. M. Butler, D. D. (*Ecclesiastical History*). Among those who have published sermons or other works maintaining High-Church views are Bishop J. H. Hopkins (*Law of Ritualism*), his son, J. H. Hopkins, F. C. Ewer, Morgan Dix. Low-Church views have been defended by Bishop C. P. McIlvaine (*Truth and Life, True Temple*), Bishop G. T. Bedell (*Ecclesia Docens*). Rev. Richard Newton has written a *Life of Christ* and numerous books for the young. Among the prominent preachers who have published sermons are S. H. Tyng, C. D. Washburn, A. H. Vinton, and Phillips Brooks, who has also published *Lectures on Preaching*. Other authors are Bishops W. I. Kip, J. Williams, W. B. Stevens (*Parables of our Lord*), F. D. Huntington (*Christ and the World*), A. Cleveland Coxe (*Apollos*), S. S. Harris; of other clergy, James Craik (*Divine Life and New Birth*), E. A. Washburn (*Social Law of God*), Samuel Osgood, B. Franklin, J. H. Egar (*Threefold Grace of the Trinity*), E. J. Stearns (*Faith of our Forefathers*), Elisha Mulford (*Republic of God*), W. R. Huntington, R. Heber Newton, and W. W. Newton. Hugh Davy Evans, an eminent lawyer, also contributed to church literature.

In the *Presbyterian* denomination, to the period succeeding the Civil War belong the theologians Prof. H. B. Smith (*Faith and Philosophy*), Prof. W. G. T. Shedd (*Sermons to the Natural Man*), Prof. A. A. Hodge (*Outlines of Theology*), Prof. F. L. Patton (*Inspiration of the Scriptures*), T. H. Skinner (*Discussions in Theology*), N. L. Rice. Among its historians are Prof. Philip Schaff, who has also labored in other fields (*Christ in Song, Creeds of Christendom, Church History*), Lyman Coleman, and E. H. Gillett (*Presbyterian Church in the United States*). Among commentators on Scripture are M. W. Jacobus, W. S. Plumer (*Studies in the Psalms*). Other writers are Prof. W. H. Green (*Moses and the Prophets*), Prof. C. W. Shields (*Religion and Science*), R. M. Patterson (*Paradise*), R. D. Hitchcock, S. T. Spear (*Church and State*), W. Adams, H. J. Van Dyke (*Lord's Prayer*), Prof. Stuart Robinson, John Hall, R. L. Dabney (*Sensualistic Philosophy*), B. M. Palmer (*The Family in its Civil and Churchly Aspects*), J. H. Brookes, S. Irenæus Prime, C. W. Baird, Herrick Johnson (*Plain Talk about the Theatre*), J. W. Dale, J. H. McIlvaine, C. S. Robinson, T. D. W. Talmage.

Rev. H. M. Dexter is the historian of the *Congregationalists* (*Congregationalism as Shown in its Literature*), and Prof. G. P. Fisher has published *inter alia* a popular *History of the Reformation*. Eminent Congregationalist writers, whose works belong chiefly to an earlier period, are John Todd, J. B. Walker, G. B. Cheever, Horace Bushnell, Leonard Bacon, Enoch Pond. To the present period belong S. C. Bartlett, E. A. Park, Egbert Smyth, Austin Phelps (*Pastoral Theology*), J. H. Thayer, Henry Ward Beecher (*Life of the Christ, Yale Lectures on Preaching*), Charles Beecher (*Redeemer and Redeemed*), T. K. Beecher (*Our Seven Churches*), Henry Cowles (*Notes on the Old and New Testaments*), J. L. Diman (*The Theistic Argument*), Lyman Abbott, R. S. Storrs, L. W. Bacon, J. M. Whiton, P. A. Chadbourne, J. H. Seelye, Newman Smyth (*Old Faiths in New Light*). Joseph Cook has published several series of lectures on the moral, religious, and social questions of the time.

Among the theologians of the *Baptist* denomination are J. M. Pendleton, G. D. B. Pepper, Alvah Hovey; among its historians, William Cathcart (*Baptist Cyclopædia*), J. B. Jeter, Barnas Sears, G. W. Anderson; among commentators, H. B. Hackett, A. C. Kendrick, G. D. Bliss, and H. J. Ripley. T. J. Conant devoted much labor to new translations of books of the Bible. Other authors are William R. Williams (*God's Rescues*), G. Dana Boardman (*Creative Week, Mountain Instruction*), Pharcellus Church, S. Ives Curtiss, W. C. Wilkinson, W. W. Gardner.

In the *Methodist Episcopal* denomination Rev. Abel Stevens has published the history of early Methodism both in England and in America, and numerous other writers have prepared local histories and biographies. McClintock and Strong's *Cyclopædia of Biblical, Theological, and Ecclesiastical Literature* (both editors being Methodists) deserves high praise for accuracy, comprehensiveness, and catholic spirit. Bishop M. Simpson has also published a *Cyclopædia of Methodism*. Other denominational authors are Bishops J. F. Hurst (*History of Rationalism*), E. O. Haven (*Pillars of Truth*), H. W. Warren; and of other clergy, W. F. Warren, D. D. Whedon (commentaries), H. Mattison, F. Gardiner, Daniel Curry, Daniel Dorchester (*Religious Progress*), J. H. Vincent (various books on Sunday-schools). Of the Methodist Episcopal Church, South, Dr. T. O. Summers, Bishop H. N. McTyeire, and Rev. A. G. Haygood (*Our Brother in Black*) are prominent writers.

Foremost among *Lutheran* writers was the late Rev. Dr. C. P. Krauth, who in his history of the *Conservative Reformation* vindicated the claims of the Lutheran Church. Rev. J. G. Morris has written much on the life of Luther, Rev. J. A. Seiss on the Apocalypse. C. F. W. Walther is the leading German Lutheran theologian. W. J. Mann and S. S. Schmucker also hold a prominent place.

The most prominent theologian in the German branch of the *Reformed Church* is John W. Nevin, D. D. This denomination, as well as the Lutheran, did much to make German theological literature known in America. Its principal organ was the *Mercersburg Review*, to which Dr. Nevin, Dr. P. Schaff, Profs. Thomas Apple and E. V. Gerhart contributed. Rev. Henry Harbaugh wrote several biographies and popular books (*Our Heavenly Home*). Other writers are J. H. A. Bomberger, S. R. Fisher, L. H. Steiner. The history of the other branch of the *Reformed Church* has been written by D. D. Demarest (*History of the Reformed Protestant Dutch Church*). Other authors are A. R. Van Nest, T. W. Chambers, John Lillie, and Prof. Tayler Lewis.

Swedenborgians, though not numerous as a denomination, have been diligent in publishing their views. Among their writers are Henry James, B. F. Barrett, Chauncey Giles, Theophilus Parsons (*Deus-Homo*), W. H. Holcombe (*The Other Life*), W. B. Hayden, Woodbury M. Fernald.

The *Unitarians* have always been noted for literary activity. Prominent writers of this denomination, whose works belong chiefly to an earlier period, are Orville Dewey, C. A. Bartol, W. H. Furness, H. W. Bellows. Of the present time are A. P. Peabody, J. Freeman Clarke (*Ten Great Religions*), Robert Collyer, Robert Laird Collier, G. S. Merriam (*Living Faith*), S. J. May, C. T. Brooks, W. R. Alger, Ezra Abbot (*Authorship of the Fourth Gospel*), E. H. Sears, J. W. Chadwick, J. H. Allen. Samuel Johnson prepared elaborate studies of *Oriental Religions*.

Among other writers on religious subjects are S. J. Andrews (*Life of our Lord upon Earth*), Hosea Ballou second (*Ancient History of Universalism*), E. H. Chapin, John Miller (*Fetich in Theology*), Dwight L. Moody the evangelist. O. B. Frothingham, Felix Adler, and others have opposed Christianity, though advocating theism. R. G. Ingersoll has bitterly assailed all religion.

Philosophy.—In the department of speculative, moral, and mental philosophy America has furnished a due proportion of writers. The Scotch philosophy has been most widely accepted, and has recently been ably expounded by Dr. James McCosh and Pres. Noah Porter (*The Human Intellect*). Cousin's eclecticism has been presented to English readers by C. S. Henry. The views of Coleridge have been supported by Prof. W. G. T. Shedd and by Joseph Torrey. Jones is an advocate of a Christian Platonism which was also found in the writings of Prof. Tayler Lewis. Kant has found disciples in J. H. W. Stuckenberg (*Life of Immanuel Kant*) and John Watson of Canada; Schelling, in Dr. J. W. Nevin and E. V. Gerhart; Trendelenberg, in George S. Morris. W. T. Harris, editor of the *Journal of Speculative Philosophy*, Anna P. Brackett, and Rev. E. Mulford are expounders of Christian Hegelianism. Judge J. B. Stallo of Cincinnati, who formerly belonged to this school, has in his later writings separated from it. L. P. Hickok, W. D. Wilson, J. Elmendorf, John Bascom, and Rowland Hazard have propounded philosophical systems or theories more or less original. B. F. Cocker, after discussing Greek philosophy, published *The Theistic Conception of the World*. The agnosticism of Herbert Spencer and Bain has found its most ardent advocates in Prof. E. L. Youmans and John Fiske (*Cosmic Philosophy*). Many of the foregoing writers have treated also of moral philosophy. Besides these, we must not omit Mark Hopkins (*Law of Love*), E. H. Gillett (*God in Human Thought*), and H. N. Day.

Philology.—American scholars have contributed to the investigation and elucidation of the ancient languages, both of the Old World and of the New. Numerous grammars and dictionaries of the classical languages have been issued, as well as editions of ancient authors, and their merits have in many cases been recognized abroad. W. D. Whitney, besides special works on Oriental subjects, has published lectures on *Language and the Study of Languages*. T. R. Lounsbury, besides some critical works, has published a text-book of Early English; F. A. March, several works on Anglo-Saxon; S. S. Haldeman, treatises on English etymology. F. J. Child has devoted himself to researches in early English literature. The subject of Americanisms has been treated by J. Russell Bartlett, Schele De Vere, A. L. Elwyn and others. Richard Grant White, Fitz-Edward Hall, William Swinton, and W. Matthews have written essays on various subjects connected with common speech.

Poetry.—Longfellow, Bryant, Whittier, Holmes, and other American poets whose fame was established before the Civil War, have since that time made important additions to their works. Without attempting to specify these or determine their merits, we pass on to mention some of the recent verse-writers. The poems of T. B. Aldrich, E. C. Stedman, R. K. Weeks, and R. W. Gilder are noted for their delicacy and grace. Sidney Lanier was a true poet of the South, and Henry Timrod, who was called "the Southern Tyrtæus," has been succeeded by his biographer, Paul H. Hayne. Rev. Ray Palmer has been especially successful in the difficult art of hymn-writing. Many American women have shown a noteworthy gift of poetical expression; among these Mrs. Celia Thaxter, Mrs. H. H. Jackson ("H. H."), Lucy Larcom, and the precocious Goodale sisters show an ardent love of nature. The sisters Alice and Phœbe Cary, and their biographer, Mrs. Mary Clemmer, Mrs. Margaret J. Preston, Mrs. S. M. B. Piatt, Emma Lazarus, Laura C. Redden ("Howard Glyndon") deal more with the varying moods of the soul and the experiences of life. Walt Whitman has gathered his writings into a volume, and still furnishes a topic for critical discussions. Joaquin Miller, the "poet of the Sierras," C. P. Cranch, J. G. Saxe, John J. Piatt, Mrs. A. D. T. Whitney, "Carl Spencer," William Winter, W. M. Carleton, Charles Heavysege, John B. O'Reilley and B. F. Taylor, are among those who would be entitled to critical mention in any general review of the subject.

Fiction.—Numerous writers of American fiction have given the peculiar features of life in some special section of the republic. Bayard Taylor, whose earlier works were narratives of foreign travel, described in his novels the Middle States, and especially South-eastern Pennsylvania. Edward Eggleston has portrayed characters belonging to the upper Mississippi Valley fifty years ago. George W. Cable has given lifelike pictures of the Creoles of Louisiana, and J. Esten Cooke of the planters of Virginia; while W. M. Baker depicts certain phases of life in the South and South-west. Some of J. W. De Forest's novels relate to the social conflicts occasioned by the Civil War, and A. W. Tourgée's mostly to the period of reconstruction in the South. H. H. Boyesen's stories are Scandinavian as to character, and usually so as to scene. Aspects of New-England life have been touched by the later works of Harriet Beecher Stowe, and by those of Louisa M. Alcott, Adeline D. T. Whitney, Elizabeth Stuart Phelps, Rose Terry Cooke, Harriet Prescott Spofford, and others, the New England field having been prolific in authorship. Rebecca Harding Davis has located her stories mostly in the Middle States, and the group of Southern writers includes Mrs. Augusta J. (Evans) Wilson, author of *Beulah*, Frances C. Fisher ("Christian Reid"), Marion C. L. Reeves, and Mrs. E. N. Hood. E. E. Hale has written many stories, in which the moral purpose is evident. J. G. Holland (who also moralized as "Timothy Titcomb"), Julian Hawthorne, who has inherited his father's romanticism, Mrs. Frances Hodgson Burnett, Thomas Bailey Aldrich, J. T. Trowbridge (also the author of several juvenile works), George P. Lathrop, Mary Mapes Dodge, Adeline Trafton, Mary Hallock Foote, M. Virginia Terhune ("Marion Harland"), Amanda M. Douglas, and others have contributed to the volume of fiction with marked success.

Juvenile.—Many popular writers have chosen to write for the amusement or instruction of the young, and there is probably no department of American literature in which a greater advance has been shown within the last ten years. Among the prominent writers are William T. Adams ("Oliver Optic"), Elijah Kellogg, Charles Carleton Coffin, William O. Stoddard, Hezekiah Butterworth, Noah Brooks, Horace E. Scudder, Sarah C. Woolsey ("Susan Coolidge"), Mrs. A. M. Diaz, and several of the female writers already mentioned in other departments. Frank R. Stockton, who has written delightful fairy-tales for children, has also displayed a high talent for humorous writing.

Humor.—Humor has long been recognized as a prominent feature in American character, and accordingly occupies a prominent place in our popular literature. The voice of the majority has assigned Samuel L. Clemens ("Mark Twain") the foremost place in this department, and he has continued for years to fill popular expectations. F. Bret Harte in his romantic pictures of California life has combined genuine humor with true pathos, though he seems too much inclined to see virtue as a prominent quality in the vicious. Charles Dudley Warner's humor is of a more quiet, refined kind. The newspapers give abundant room to other humorists whose writings are often collected into volumes. Among these are Charles Heber Clark ("Max Adeler"), Robert J. Burdette, James M. Bailey, Charles H. Smith ("Bill Arp"). Charles G. Leland, who has done more important work in other fields, has become most widely known by his humorous ballads in German-American. Joel Chandler Harris by his sketches in the character of "Uncle Remus" has added interesting matter to the world's stock of folk-lore.

Essays and Criticism.—Many of the writers mentioned under other heads have contributed also to this department. James Russell Lowell's three volumes *Among my Books* (first and second series) and *My Study Windows* contain some of the best literary essays in the language. Edwin P. Whipple has long occupied a foremost place among the critics of English literature and American life. H. T. Tuckerman was one of the most prolific of American essayists. G. H. Calvert has added to his earlier works an essay on Goethe. Henry James, Jr., in his *French Poets and Novelists* has shown an intelligent appreciation of the authors he discusses. H. H. Boyesen has published an interesting volume on Goethe and Schiller. The poet E. C. Stedman has written thoughtful criticisms on contemporary English poets, and T. S. Perry has, among other work, given an excellent presentation of the literature of the last century. Rev. H. N. Hudson has continued his labors in Shakespearian criticism. John Weiss and Henry Giles labored in this and other fields. J. Brander Matthews has discussed with keen insight the modern French dramatists. Moncure D. Conway, an American who has resided for years in England, presents in his sketches radical views of religious and social topics. Miss Abigail Dodge ("Gail Hamilton") is a vivacious writer and pungent controversialist. John Fiske has produced numerous historical and miscellaneous essays exhibiting various applications of the theory of evolution. John Burroughs is a lover of birds and wild flowers, of the fields and woods; his writings convey to the reader a distinct sense of being in the open air. Wilson Flagg has also treated of the birds and seasons of New England. Donald G. Mitchell (formerly known as "Ik Marvel") gives pleasant expression to a farmer's thoughts. Washington Gladden has treated happily religious and social questions. R. Grant White has criticised American and English speech and manners. Clarence Cook has given valuable hints on art and house-decoration. J. T. Fields in his *Yesterdays with Authors* has given us a pleasing collection of reminiscences.

No attempt has been made here to give a list of numerous writers in various departments of science, as these will be mentioned under appropriate heads.

AMERICUS, the county-seat of Sumter co., Ga., is on the South-western Railroad, 71 miles S. W. of Macon and 80 miles north of the Florida line. It has three good hotels, eight churches, a female college, a high school, several public schools, a public library, an opera-house, and a national bank. It has also a carriage-factory, over 200 business-firms, and a fire department including two steam fire-engines. It is the largest city in South-western Georgia, and is the business-centre of a district comprising six counties, its average annual cotton receipts being 30,000 bales. In the surrounding country nearly all varieties of fruits, grains, and flowers can be raised successfully. Population, 3635.

AMES, EDWARD RAYMOND, D. D. (1806–1879), a distinguished bishop of the Methodist Episcopal Church, was born at Amesville, Athens co., Ohio, May 20, 1806. He was of Puritan stock and type. His grandfather was a Massachusetts chaplain in the army of the Revolution, and died at Valley Forge in 1778. While receiving his education at the Ohio University, Athens, Ohio, Mr. Ames supported himself by his own labor as teacher. While a student in this institution he consecrated his life to Christ, and connected himself with the Methodist Church. After leaving the university he opened at Lebanon, Ill., a school which has since grown into M'Kendree College. In 1830, Mr. Ames was licensed to preach, his papers being signed by Rev. Peter Cartwright. In August of the same year he was received into the itinerant ministry of the Illinois conference. In 1832, by the organization of the Indiana conference, he became a member of that body, and, with the exception of two years, during which he was stationed in the city of St. Louis, his ministry as a pastor was thereafter within that State. In 1840 he was elected missionary secretary for the South and West. He discharged the duties of this office for four years, during which he visited the several Indian missions and established schools among several tribes west of Arkansas. In 1848 he was elected president of the Indiana Asbury University, but he declined the position, on the ground that he was better adapted to the itinerant ministry. He was chosen a member of the General Conferences of 1840, 1844, and 1852, at the last of which he was elected bishop, along with Matthew Simpson, Levi Scott, and Osman C. Baker. This office he continued to fill until his decease, at Baltimore, Md., April 25, 1879.

Bishop Ames was tall in person and of commanding presence. His talents were those of the statesman and the general rather than of the pulpit orator. His views were broad, his plans comprehensive and readily formed. He read men with the quickness of intuition, and decided with promptness and inflexible firmness. During the Civil War he was selected by the national Government as one of a commission to confer with the leaders of the Southern Confederacy relative to an exchange of prisoners. The duty was delicate and difficult, but was successfully performed. In the social circle he was genial and tender; in the bishop's chair he was severely humorous and irreversible in decision. Disobedience to orders was an offence which he neither committed himself nor tolerated in others. During his missionary secretaryship he at one time travelled through the entire Indian territory from Texas to Lake Superior, camping out for the whole distance, subsisting with his party for two days at a time upon a handful of moistened sugar. His powerful will kept him at work when his life had become a continued struggle with weakness and pain. On one of his last days he said, "When I can do no more work I care not how soon I die." (D. W. C. H.)

AMHERST COLLEGE is situated in the town of Amherst, Hampshire co., Mass. The town was named in honor of Gen. Jeffrey Amherst, the hero of Louisburg, and the county, long distinguished for the large percentage of young men it has sent to college, is now also remarkable for the number and character of its institutions for the higher education of both sexes. The oldest of these, Amherst College, was founded in 1821. Like the universities of the Old World and all the early American colleges, it had its origin in a religious impulse. The great awakening of Christian activity which characterized the first part of the present century gave rise not only to organized agencies for the evangelization of the world, but also to the leading theological seminaries of America. At the same time and of the same spirit Amherst College was born. The first step was the raising of a fund of $50,000, of which five-sixths of the interest should be expended annually in aid of needy and worthy young men preparing for the ministry, and the other sixth be added to the principal for its perpetual increase. The first college edifice, the present South College, was erected mainly by voluntary contributions of materials, money, and labor by the Christian men of Amherst and the neighboring towns, and half of the rooms were furnished, in the plain and simple style of those days, by the Christian women of Hampshire and the adjoining counties. Amherst College imposes no religious tests, and is subject to no prescribed ecclesiastical authority. The church which the faculty and students for the most part attend is styled simply "The Church in Amherst College.' But the founders, trustees, faculty, and friends of the college have been chiefly orthodox Congregationalists.

On the 18th of Sept., 1821, the college was opened with the inauguration of a faculty consisting of a president, two professors, and two tutors. The next day 47 students were examined and admitted, of whom nearly one-third came, with their president, Rev. Zephaniah Swift Moore, from Williams College, which, it was then generally expected, would be united with the institution at Amherst. Nourished by the same religious sentiment to which it owed its origin, the institution had a rapid growth. In 1822 it had 59 students; in 1823 it had 98; in 1824 it numbered 127; and in 1825 it had increased to 136. Yet so strong was the opposition arrayed against it by sectional jealousies, rival interests, and sectarian prejudices that during all this time the legislature refused to give it a charter, and it was only when the friends of Amherst in every part of the State rallied and resolved that they would vote for no man who was not in favor of granting this right that, on the 21st of Feb., 1825, the institution, hitherto known only as "The Collegiate Institution at Amherst," was incorporated under the name of Amherst College and admitted to the rights and privileges of the other colleges of the State. But meanwhile, Pres. Moore, overwhelmed with the responsibilities and anxieties of his position, had succumbed to an attack of acute disease in June, 1823.

After much hesitation, Rev. Heman Humphrey, a graduate of Yale, pastor of a large church in Pittsfield, then accepted the presidency of the institution, which had not yet the charter, nor even the name, of a college. But under his administration, with the cordial co-operation of his worthy associates, it continued to grow rapidly and steadily, till in 1836 the one dormitory had become three, with a large edifice containing chapel, library, mineralogical cabinet, chemical laboratory, and recitation-rooms; the faculty had increased from five to twelve; the students numbered 250. But the growth was not altogether natural or normal.

The rapid multiplication of students led to the erection of buildings in advance of pecuniary means, and involved the college in debts which at length threatened bankruptcy. The number of students diminished rapidly, reaching 128 in 1846. Embarrassments of every kind pressed upon the college, and the trustees reluctantly accepted the resignation of Pres. Humphrey. Prof. Edward Hitchcock, though not himself a graduate of any college, was then called to the presidency, and by his wise policy saved the college. At his suggestion the president and professors undertook to farm the revenues themselves, receiving for their support only what was left after defraying the other necessary expenses. This self-denying effort, together with a milder administration of discipline, awakened public sympathy, and a series of measures was commenced which during the ten years of Dr. Hitchcock's presidency extinguished the debt, added an astronomical observatory, a library, and two cabinets of natural history, secured the endowment of four professorships, and doubled the number of undergraduates. He resigned the presidency in 1854, remaining, however, as professor of natural theology and geology. Rev. W. A. Stearns, D. D., a graduate of Harvard and a pastor in Cambridge, was chosen to fill his place as president. Under his administration money for buildings and endowments flowed in to the amount of $750,000. Of the twelve college edifices which now stand in the campus, the six finest were added during his twenty-three years' presidency. The college church was built chiefly at the expense of his son, William F. Stearns, and Walker Hall was erected by Dr. William J. Walker, with contributions from other friends. It may be said of Dr. Stearns he found the college brick and left it granite.

At the same time more ample provision was made for instruction in chemistry, the modern languages, and English literature, and optional courses of study were freely opened for the members of the Junior and Senior classes. This was also emphatically the period of endowments for scholarships and prizes. More than fifty scholarships were endowed, varying in annual income from $40 to $300, and distributing each year over $4000 among the students, while prizes were established which award $1000 annually for excellence in the several departments. Dr. Stearns was on the point of resigning the presidency when he died suddenly, in June, 1876, at the age of seventy.

His successor, Prof. Julius H. Seelye, was not only professor of mental and moral philosophy, but also member of Congress, at the time of his appointment, having been elected to that office by the spontaneous movement of the people of the district. Shortly before his election he had visited India by special appointment of the American Board of Commissioners for Foreign Missions, and addressed immense audiences of Brahmans and other educated Hindoos in a series of lectures on the evidences and claims of Christianity, which were printed by some of the leading Brahmans, and which still have a wide circulation. The college has been increasingly prosperous under his administration. The faculty has been enlarged by the establishment and endowment of new professorships, assistant professorships, and instructorships, and much progress has been made towards the realization of a favorite idea of the president, that instruction should be, so far as possible, personal and Socratic, and therefore in small sections admitting of thorough individual drill and persistent personal influence. The number of students has increased steadily, and indeed has already reached about the maximum which here can be best educated together. In less than six years additional funds have been received or secured to the amount of $500,000. In 1882 an annex to the college library has been erected, and the funds have been provided and the plans formed for the speedy erection of a larger and better gymnasium, as well as a new and improved chemical laboratory.

Twice in its history the college has sustained a heavy loss by fire. In the winter of 1857 the old North College was burned to the ground. But through the generosity of Hon. Samuel Williston, Williston Hall sprang up phœnix-like out of the ashes, and the lost dormitory was replaced soon after by East College on another site. In the spring of 1882 a second and far greater calamity befell the college in the destruction of Walker Hall, its finest edifice. This was in some respects irreparable, but by means of the insurance and the liberal donations of friends an improved Walker Hall has risen to be again the chief ornament of the college grounds.

Pres. Seelye's administration has been characterized by what is called "the new system at Amherst." Its essential points are—1. Instead of penalties, which figure so largely in the old American college system, the student gives a written promise to obey the college laws; and this is regarded as a contract, on the nonfulfilment of which he *by his own act* ceases to be a member. 2. Students are not required to render any excuse for absences from recitation, but if in any department any student's absences exceed one-tenth of the entire number of recitations he thereby drops out of that department, and so far out of the college, and can recover his standing only by an examination proportioned to the degree of deficiency. The law is thus self-executing; the students largely govern themselves. Under this system they attend college exercises better, learn self-control, honor, and manliness, and a new era of good feeling and good will exists between them and the faculty. Fagging, hazing, and rioting are under the ban of a ruling public sentiment, and yet a genuine class-feeling and a generous rivalry between the classes provoke to an honorable emulation in scholarship and gentlemanly deportment.

The fund in aid of students preparing for the ministry has grown to $75,000; the number of such students is greater than in any other college. At the same time, scholarships in aid of students not preparing for the ministry are amply provided, and there is an increasing number of those students who do not need pecuniary assistance.

In 1882 the faculty consists of thirty persons, and there are 352 students, all in the regular course. The annual income is about $60,000. At the semi-centennial celebration in 1871 the college had 1936 alumni, of whom 1450 were supposed to be living. In the triennial catalogue of 1878 there were 2398 graduates enrolled, of whom 897 were ministers, 97 missionaries in foreign lands, 181 doctors of medicine, 313 lawyers, and 257 professors and teachers; 208 served in the War for the Union, of whom 28 laid down their lives in that cause. Add to these the four later classes, and there is in 1882 a total of 2690 graduates.

The college edifices have been built at a cost of $300,000, Walker Hall alone costing $120,000, and the college church $70,000. The whole property of the institution, including permanent funds, professorships, scholarships, prizes, etc., is valued at $1,500,000. With the exception of $50,000 granted by the State, all this is the gift of private charity. The donors have been chiefly the Christian men and women of Massachusetts, and very much of it was given in small sums. Hon. Samuel Williston, Dr. William J. Walker, and Hon. Samuel A. Hitchcock have been the largest benefactors. Hon. Chester W. Chapin, Mrs. Valeria G. Stone, and Mr. Thomas McGraw have given $50,000 each for the endowment of professorships. The Hitchcock Ichnological Cabinet, the Adams Collection in Conchology, the Shepard Meteoric Collection, and the Mather Art-Gallery are unique and of unsurpassed value and excellence; the Barrett Gymnasium, with its accompanying system of exercise and instruction, constitutes a peculiar feature; all the students are required to exercise regularly under the direction of a professor who has charge of their health and physical culture.

Amherst College has had five presidents, all clergymen who had been pastors. Dr. Seelye, the present incumbent, is an alumnus of the college, as are also most of the present professors. Among former professors and tutors may be mentioned Jacob Abbott, Nathan W. Fiske, Bela B. Edwards, Edwards A. Park, Henry B. Smith, William C. Fowler, Roswell D. Hitchcock, Marshall Henshaw, Francis A. March,—many of whom were also graduates of Amherst. Among the other alumni there have been many widely known as ministers, as missionaries, as statesmen, as educators, and as leaders of organized Christian benevolence. But the strength and glory of Amherst College are to be seen, as might be expected from its origin and history, in the rank and file of its alumni, distinguished chiefly for their usefulness as Christian teachers, preachers, and working men in the professions, who, coming from the middle classes, "flow back where they began," to bless the common people by a widely-diffused, enlightened, and aggressive Christian influence.

See also *Reminiscences of Amherst College*, by Edward Hitchcock, 1863; *Exercises of the Semi-Centennial of Amherst College, 1821–1871; History of Amherst College*, by W. S. Tyler, 1873. (W. S. T.)

AMICUS CURIÆ (Lat., a friend of the court), in law, one who, without having any interest in a cause of his own knowledge, makes a suggestion on a point of law or of fact in regard to which the court is doubtful or mistaken. The information may extend to any matter of which the court may and ought to take judicial notice; *e. g.*, a statute or case overlooked or an error evident on the face of the proceedings. In a slightly different sense of the term any one may apply as *amicus curiæ* to chancery in favor of an infant to whom he is no relation for the appointment of a guardian. The phrase has even been applied to counsel who argued a case in which he was not actually interested, but which involved the same question of law as another case in which he was regularly retained. (J. M. G.)

AMNION (Gr. ἀμνιος, a vessel for receiving liquids), in anatomy, one of the appendages or annexes of the fœtus, being the innermost fœtal membrane, next to the body, containing the fluid (*liquor amnii*) in which the fœtus is immersed. An amnion is developed in the three higher classes of vertebrates—Mammalia, Aves, and Reptilia—but not in Batrachia and Pisces (*Ichthyopsida*). In the former the amnion forms a bag which completely envelops the body of the fœtus, and when distended with fluid appears also to include the umbilical cord and fœtal surface of the placenta; but these structures are outside the amniotic cavity. The amnion is formed by an epiblastic (exodermic) layer of cells of the early embryo, which, reflected away from the ventral surface of the embryo, rises on all sides and comes together over the back of the embryo. Obliteration of the line of union and absorption or fusion of the chorionic layer result in a simple shut sack, the former outside of which is now internal, presenting to the body of the fœtus, and the former inside of which is now external, presenting to surrounding structures. As the permanent cavity distends with the liquor amnii, the sac grows to enwrap the umbilical cord (navel string) and invest the unattached surface of the placenta, from the rim of which it appears to extend in all directions. In ordinary language, the mature amnion is the "bag of water" ordinarily ruptured early in parturition by the pressure of the contracting uterus. The amnion subserves, among others, the purposes of isolating and supporting the fœtus in a bland liquid which diminishes concussions, and of dilating the cervix uteri equably and continuously. The fœtus is sometimes expelled without rupture of the amniotic sac, or it may be so ruptured as to envelop the head of the fœtus in a sort of cowl: a child in that case is said to be "born with a caul." (See ALLANTOIS.) (E. C.)

AMŒBA (Gr. ἀμοιβός, changing; ἀμείβω, I change, alluding to its shapelessness, or rather its multiformity), a single-celled animal or individual organism consisting of a nucleated and vacuolated mass of sarcode or protoplasm (living matter), with or without a structureless investing membrane; moving by means of pseudopodia, or temporary proliferations of its substance; feeding by engulfing substances in its own mass and assimilating their nutritive properties, with rejection of indigestible parts; reproducing by simple fission or self-division; responding to mechanical and chemical stimuli, and therefore possessing irritability or sensibility; apparently exercising choice in selection of food, and therefore possessing a degree of (conscious or unconscious) volition. *Motion*, *sensation*, *nutrition*, and *reproduction* being essential attributes of animality, an individual *amœba* is as truly animal as man himself. Such a creature is the common indifferent type of all *cells* whatever; and all animals consist either of a single cell or of a congeries of cells and cell-products. They are therefore either individual amœbiform cells, or an aggregation of such organisms in one compound individual; the amœba being the unit of life-form, that state of matter in which Life is first in-formed in matter, and individualized, as distinguished from simply living matter in its non-individualized state of *protoplasm*. The primary and only definite form of an amœba is the *sphere*, like that of its nucleus, exhibited when at rest; in its activities the animal is "shapeless"—*i. e.*, incessantly shifts its shape. All known forms of animated matter are foreshadowed or prefigured in amœboid motion.

Zoologically and as a genus, *Amœba* is type of a family, *Amœbidæ*, of the second order *Amœboidea* of the class *Rhizopoda*, of the sub-kingdom *Protozoa* (single-celled, or at least tissueless, animals), as distinguished by absence of a body-cavity from the *Metazoa*, including all other animals. Possessing as it does a nucleus, vacuole, and often an investing membrane, it may be said to have some sort of *structure* or organization, which might even appear complex to beings possessing more acute powers of observation and clearer mental faculties than those of the human race; but, practically, *Amœba* is structureless as well as formless. The *amœboids* are said to differ from the moners (order *Monera*) in that the latter are merely particles or masses of living matter (protoplasm) capable of nutrition and reproduction, whether individualized or not; but are absolutely homogeneous, having neither nucleus nor vacuole. But the distinction is not perfectly satisfactory, for in some undoubted *Amœbæ* no nucleus nor vacuole is discoverable; and it is not certain that some described moner-forms are not incipient amœboids.

A fresh-water amœboid was first discovered and described by Rösel in 1755 under the name of *Proteus*; named *Volvox chaos* and *Chaos protheus* by Linnæus; *Volvox proteus* of Pallas; *Volvox sphærula* and *Proteus diffluens*, Müller; *Vibrio proteus*, Gmelin. In 1822, Bory de St. Vincent described species of *Amiba*. All the foregoing, with various since-described species of *Amœba*, named by Ehrenberg in 1831, are considered by Leidy as one and the same species, for which the name *Amœba proteus* is now generally adopted. The genus is thus characterized by the same authority:

Animal, when at rest, a spherical or oval mass of soft, hyaline, colorless, homogeneous, pale, granular protoplasm, possessing extensile and contractile power, and in the active condition devoid of an investing membrane or any kind of covering. In motion, mostly of exceedingly variable and ever-changing form, and with no absolute distinction of parts, though frequently exhibiting more or less disposition to differentiation into an anterior and posterior region. Ectosarc (exterior substance) hyaline, crystal-clear, but, with high magnifying power, exhibiting more or less of an infinitely fine granular constitution. Endosarc (interior substance) continuous with the former, finely and coarsely granular, mingled with corpuscles of intrinsic and varied character, together with various ingesta, consisting of food, water-drops, sand, etc. Containing also a nucleus and a contractile pulsating vesicle, or sometimes more than one of either or both of these constituents. Body with no external appendages of a fixed or permanent character. Pseudopods ("false-feet," temporary proliferations of substance) digitate, simple or branching, cylindroid and blunt, or more or less tapering and pointed, or short and broadly lobate, consisting of extensions of the ectosarc, with variable proportions of the endosarc, or of the former alone. Animal in the quiescent state, purged of food and other ingested matter, globular in form, and invested with a structureless membrane, apparently produced by a coagulation of a portion of the ectosarc.

Amœba proteus is common almost everywhere in the slime and ooze of ponds and ditches. In spherical form it is up to 0·2 mm. in size; with pseudopods protruded it has been observed to occupy a space of 0·6 by 0·3 by 0·2 mm. It is thus one of the largest species, and that most frequently subjected to the microscope, under which its literally protean form and ceaseless changes may be readily observed. The elements observed by Leidy in the endosarc are substantially as follows: 1. Protoplasmic granules, from the finest and most diffuse to those more distinct, darkly defined, and resembling molecules of oil. 2. Rather large, spherical, homogeneous or indistinctly granular corpuscles, apparently fluid or semi-fluid, in variable quantity. 3. Round, oval, or irregular bodies of various sizes, clear, colorless, highly refractive, resembling starch-granules in chemical reaction, and apparently of that nature. 4. Inconstant globules, darkly defined and highly refractive, colorless or colored, apparently oleaginous. 5. Food-balls, very variable according to their nature—yellow, brown, blackish, often green—and recognizable as composed of single-celled algæ; generally seen in a clear halo, indicating water swallowed with the food. Sometimes numbers of clear water-drops are also seen to be developed in the endosarc, as if from a concentration of the more liquid part of the protoplasm. In the endosarc are also observed more consistent particles of food, such as diatoms, desmids, green single-celled algæ, and zoospores of filamentous algæ; occasionally animal matters, especially rotifers, *Arcella*, *Difflugia*, or *Trinema*; even cellular tissue of leaves, woody fibres, hairs, sawdust, etc., may be jumbled together. 6. Minute crystals, pretty constant in the endosarc, and apparently intrinsic. 7. The important element, the nucleus, variable in position, usually posterior; of variable size and degree of rotundity, often set in a halo of clear protoplasm; measuring characteristically about $\frac{1}{500}$th of an inch in greatest diameter; granular in substance; no investing membrane or nucleolus determined; sometimes double; sometimes apparently absent. 8. The vacuole, a clear liquid globule, constituting the contractile or pulsating vesicle. There may be two or several of such. "It usually occupies a position just back of the nucleus, but not unfrequently, in the movements of the endosarc, is shifted to a position in advance. The contractile vesicle is ordinarily observed very gradually to enlarge, and then rather abruptly to collapse, so as to disappear altogether from view. After a brief interval it again reappears in the same or nearly the same position. Starting as a minute sporule, the vesicle gradually increases as before until it reaches its former size, when it once more abruptly collapses. The increase, collapse, disappearance, and reappearance of the contractile vesicle occur successively and incessantly in a rhythmical manner, reminding one of the regular action of the heart in higher animals."

"In the progressive movements of *Amœba proteus*, and the extension of its pseudopods, the flow of the endosarc is accompanied with a more or less thorough mingling of all its constituents. The smallest elements are hurried along most briskly, while the largest exhibit more or less inertia, the nucleus and contractile vesicle almost always being hindermost in the race. A remarkable fact in the streaming of the endosarc, with all its varied constituents rolling among and jostling one another, is the circumstance that the food-balls with their liquid envelope, the water-vacuoles, the contractile vesicle, and all else, retain their integrity, as if they were solid or contained each in a membranous sac. Never are the materials observed to break and run together as a result of the continued jar to which they are subjected." The reader is referred to Leidy's masterly monograph cited for further particulars (*Rep. U. S. Geol. Surv.*, vol. xii., 4to, Washington, 1879).

The physical activities of the *Amœba* are summed by Foster as six: it is contractile; irritable and automatic; receptive and assimilative; metabolic and secretory; respiratory, inhaling oxygen and exhaling carbonic dioxide; and reproductive. These are reducible to the four above named: sensation, motion, nutrition, and reproduction, the common properties of all *cells*. Digestion and respiration are alike conserved in metabolism, the chief difference being rather in the character of the ingesta and ejecta than in the process.

All the tissues of higher organisms being cells or cell-products (results of unicellular metabolism), it would appear that the proper and natural *classification of the tissues* is a zoological one. Lucidity and precision will be conferred upon histology when that branch of science acts upon, as it has long recognized, the fact that various species, genera, and perhaps higher groups, of amœboid animals form a physiological fauna, or colony, in the bodies of all the *Metazoa*. Histogeny is simply the mode of reproduction of these creatures; and all physiology is only the natural history of their lives. To name, describe, and classify them is to convey the most correct notion of the facts in the case. There is no reason why the ordinary rules of zoological nomenclature should not be as applicable here as elsewhere. Bone, for example, is a glomeration of *Osteamœbæ*, distinguished by possessing an earthy exoskeleton, like the shell of any foraminiferous rhizopod; different stages in the life-history of such an individual organism from its formative stage, when it is termed an osteoblast, through the encysted stage of a multiradiate "bone-corpuscle," with its mineral shell, to the period of decay when the empty shell encloses a "lacuna" and "canaliculi," afford the natural history of bone. The cells of muscle, again, are of two species of *Myamœba*; *M. striata*, constituting ordinary red, striped, "voluntary" muscle; and *M. lævis*, the pale, unstriped, "involuntary" muscle of the alimentary canal and elsewhere. The "gray" and "white" cells of nerve-tissue are similarly different species of *Neuramœba*. Different kinds of mucous endothelium furnish varieties or species of *Enteramœba*. The "characters" by which animal organisms may be recognized and defined when they compose the bodies of *Metazoa* are as sound and as entirely available for classification as those exhibited by organisms of the same grade when they lead individual lives, like *Amœba*, or are merely massed without differentiation—like a bundle of flagellate infusorians, for example. A patch of ciliated endothelium is, in fact, a colony of *Infusoria ciliata*, of no more consentaneity of action under appropriate stimuli than, and only distinguished by extrinsic circumstances from, the animals ordinarily so named and classified in zoology. (E. C.)

AMOTION, in law, the removal from office of an officer of a corporation.

The right vested in a corporation of amoving its officers is either express or implied; *i. e.*, it is either specially conferred by the terms of the charter, or necessarily to be inferred from the fact of the corporate existence. Where the power of amotion is conferred by the charter, it may be exercised, of course, for whatever cause or in whatever manner the charter dictates. Where, however, it is not conferred by the charter, the corporation can only amove in one of two instances: (1) where an officer has committed a criminal offence of so infamous a nature as to render him unfit for the society of honest men, and has been duly indicted therefor and convicted by a jury; (2) where an officer has committed some act contrary to his oath or duty as a corporator, and which is injurious to the true interests of the corporation.

For the first cause above specified an officer may be amoved by a simple vote of the corporation. For the second cause he may be thus amoved only after a fair notice of the charges preferred against him, and a full opportunity to adduce evidence and be heard in his own behalf.

Where an officer is illegally removed, either for insufficient cause or in an irregular manner, he may have resort to the courts, who will restore him by a writ of mandamus. Courts of equity are often applied to in such cases, but the better opinion is that they have no power to afford relief. (L. L., JR.)

AMPELIDÆ (Gr. ἄμπελος, vine; ἀμπελίς, a bird which frequents vineyards), a family of oscine passerine birds, of uncertain location and definition. The name is used by different writers to cover a great variety of forms, and has no definite status in ornithology. American authorities of late restrict it to the genera *Ampelis* (*Bombycilla*), *Phainopepla*, *Ptilogonys*, and their immediate allies, which they collocate in the vicinity of the *Vireonidæ* and *Laniidæ*. (E. C.)

Carolina Waxwing, ***Ampelis cedrorum*** **(natural size).**

AMPHIBIA (Gr. ἀμφί, on both sides; βίος, life).

See Vol. I. p. 657 Am. ed. (p. 750 Edin. ed.).

1. Any animals living voluntarily or of necessity partly on land, partly in the water. Such vague sense of the term, having no more definite signification than we should now attach to *aquatic*, and applicable to animals irrespective of their natural affinities, was the original meaning. Aside from any such creatures as may voluntarily enter and leave the water, and are therefore "amphibious" in a certain sense, the *Batrachia* are those which can most properly be considered amphibious, since they hatch from eggs laid in the water, and in their larval state breathe water with gills like fish; but many of these even are confined to the water during their whole lives, not undergoing the transformation which enables them to breathe air.

2. When the term, derived from the ancients, was first introduced into modern science, *Amphibia* formed the third class of animals of the Linnæan system, about the middle of the last century. As presented by Linnæus in 1766, this class was a most incongruous assortment of creatures, embracing reptiles and a variety of fishes and fish-like vertebrates. It was divided into three orders: 1, *Reptiles pedati, spirantes ore* (*Testudo, Draco, Lacerta, Rana*); 2, *Serpentes apodes, spirantes ore* (*Crotalus, Boa, Coluber, Anguis, Amphisbæna, Cæcilia*); 3, *Nantes pinnati, spirantes etiam branchiis lateralibus* (fourteen genera of fishes and fish-like vertebrates, as the Marsipobranchii and Squali of modern systematists).

3. Cuvier used the term *Amphibia* for a division of carnivorous Mammalia, coming at the end of his *Carnaria*, and next before his *Marsupiata*. The Cuvierian *Amphibia* included the seals and walruses, being thus exactly equivalent to the *Feræ Pinnipedia*, or fin-footed Carnivora, of modern systematists.

4. The term has latterly been employed in the sense intended to be conveyed by Linnæus, with the proper rectification, as the name of one of the classes of ichthyopsidan vertebrates. In this acceptation it is equivalent to *Batrachia*, covering the frogs, toads, newts, etc. (E. C.)

AMPHIMORPHÆ (Gr. ἀμφί, on both sides; μορφή, form, from the intermediate position of the flamingoes between the storks and herons on the one side and the anserine birds on the other), a term invented in 1867 by Huxley to designate the flamingoes (*Phœnicopteridæ*) as one of the major divisions of desmognathous carinate birds. The skull and beak and the webbed toes are much as in other Lamellirostres, but the palatal structure, pterylosis, and general configuration of the body are as in *Herodiones*. (E. C.)

AMPUTATION. Etymologically, the word *amputation* denotes the removal of any excrescences or any useless or harmful portions of the body from the remainder. In modern surgery, however, it is much more strictly limited, and refers almost solely to the cutting off and complete separation from the body of some portion of an extremity.

The earliest account of this procedure is contained in the writings of Hippocrates, who lived 430 B. C., and who practised it in cases of gangrene almost or quite exclusively, making his cautious yet rude incisions only through the line of an articulation and below the point of junction of the healthy and mortifying tissues. This was so little of an improvement over the unaided processes of Nature that it is hardly to be classed as an important step in surgery, and, so far as we know, it was not until four hundred years later, during the reign of Augustus, that any material advance was made beyond this crude and imperfect method. At this time Aurelius Cornelius Celsus recorded in his admirable treatise *De Medicina* a description of the operation as practised by himself. If we accord to him a knowledge of the proper application of the ligature in the arrest of hæmorrhage—and several passages in his work seem unequivocally to warrant this—there are few of the essential steps of amputation as it is now performed with which he was not familiar. He divided the limb through the sound instead of through the diseased tissues; he separated the soft parts from the bone for some distance, and sawed through the latter at a higher level, smoothing off its rough surface; and he endeavored to procure primary union by bringing the soft parts down over the bone and approximating them. He did not, however, adopt any plan of restraining bleeding during the various steps of the operation, and consequently speaks of death as frequently occurring before it was concluded.

During the reign of Domitian, a century later, Archigenes employed a fillet or band, with which he encircled the limb close to the seat of amputation—the first recorded instance of the use of a tourniquet. Unhappily, he more than counterbalanced the good effects of this step by reverting to the use of the actual cautery in sealing the divided vessels, and by neglecting other of the wise instructions of Celsus. After the lapse of almost another century we find Galen returning to the Hippocratic precept and confining the operation to the gangrenous structures. Such was the weight of his authority, based on his undoubted learning and genius, and reinforced by his position at the court of Marcus Aurelius, which gave to all his utterances a widespread notoriety unusual at that period in matters of science, that for thirteen hundred years methods of amputation made no further progress, and in truth were not even re-established on the rational and almost scientific basis of the Celsian epoch. Paulus Ægineta, most of whose writings were compilations, and chiefly from the works of Galen, advised, as might have been expected, a similar procedure, introducing, however, the use of a piece of linen to retract the soft parts during the sawing of the bone—the modern "retractor." This trifling modification was made only after four centuries had passed, and twice as many more elapsed before any marked or beneficial modification of these barbarous procedures was proposed. Throughout this period both the Greek and Arabian medical authors seem to have followed blindly in the footsteps of their predecessors, no ray of original thought, no evidence of careful observation guided by experience in regard to this operation, illuminating their writings. Rhazes, Avicenna, Albucasis, and others reiterate the old precepts either in whole or in part, and it was left for the illustrious French surgeon, Ambroise Paré, in the middle of the sixteenth century, to teach for the first time, lucidly and unmistakably, the use of the ligature in amputations. His views, however, met with the same fate as those of Celsus, and, actuated still by fear of hæmorrhage during and subsequent to the operation, we find Fabricius of Acquapendente (1618), Fabricius Hildanus (1633), Scultetus (1655), Wiseman (1676), and Purmannus (1696), advocating the old Galenic—or rather Hippocratic—doctrines, avoiding sound parts, employing the actual cautery, and dividing the limb with chisel and mallet, with shears, or with a sort of guillotine.

The discovery by Harvey of the circulation of the blood, and the invention of the tourniquet in the latter part of the seventeenth century by Morel of France, and almost simultaneously by Young of Plymouth, England, and its improvement in 1718 by Petit, first relieved the surgical mind of anxiety as to hæmorrhage during the operation, and permitted intelligent attention to its details. Improvements then rapidly followed, some of them being merely the recognition and adoption of the old Celsian rules: the ligature came into general use; various modifications to effect the prime object of securing sufficient and serviceable flaps were made by Cheselden, Louis, Alanson, Hey, Bell, Desault, Lowdham, Verduin, Garengeot, O'Halloran, Ravaton, Liston, Syme, and others, until the introduction of anæsthetics in 1846, and of the antiseptic treatment subsequently, brought the operation to its present condition of excellence.

Like all surgical procedures of great antiquity—like all, in fact, which are not, as an inspiration of genius, conceived, promulgated, practised, and established on a sure foundation by the authority and during the lifetime of one master-mind—amputation thus outlines in its history the different principles essential to its success: the necessity of operating through healthy tissues, of controlling hæmorrhage during the operation, of preventing subsequent bleeding, of providing ample covering for the end of the bone, of favoring rapid union, etc. If we were not now familiar with these cardinal points, it would be easy to deduce them from the history of the operation.

Conditions demanding Amputation.—As surgery has become more scientific, it has grown more conservative. Many limbs are now saved which would formerly have been unhesitatingly sacrificed, and in each individual instance a careful consideration of the circumstances of the case should determine the propriety of interference. There are certain general divisions, however, of diseases and injuries requiring the removal of a limb which, by systematizing the subject, render it more comprehensible. It may be said broadly, and subject to occasional exception, that amputation is necessitated by—

1. Severe injuries, such as lacerated, contused, or gunshot wounds involving the greater portion of a limb, tearing or pulpefying all the soft parts, dividing the main vessels and nerves, or stripping all the muscular and other tissues away from the bones.

2. Compound fractures in which the knee-joint is involved, and usually, though not so invariably, those in which the ankle-joint is implicated. In fractures involving the shoulder, elbow, or wrist joint excision is often allowable.

3. Compound fracture of the lower limb, in which the femoral or popliteal artery is torn, or even, in many cases, where the tibials are divided; certainly, in all such cases in the lower extremity where the bleeding vessel cannot be found and tied in the wound. In compound fracture of the arm, with laceration of the radial or ulnar, possibly even of the brachial, and with no other severe complication, it is proper to make an attempt to save the limb, even if the vessel has to be ligated above the wound in its continuity.

4. Compound fractures, with disorganization or actual pulpefaction of the deeper components of the limb, as manifested by the boggy, almost fluctuating, feel of the parts, the development of large vesicles on the surface, extensive ecchymosis, absence of pulse, lowering of temperature, etc.

5. Compound comminuted fractures, especially in the lower extremity, in which the entire thickness of the bone is involved for several inches, and particularly where the splinters have perforated and lodged in the surrounding muscles.

6. Compound dislocation of the knee-joint in adults.

7. Compound dislocation of any joint in which there is the additional complication of a wound of the principal artery or serious laceration of the neighboring soft parts.

8. Mortification resulting from injury or from excessive cold or heat, where the strength of the patient is good and the line of demarcation is established. Where the disease is steadily advancing, no operation is justifiable.

9. Spreading or incipient traumatic gangrene, beginning within one or two days after the receipt of an injury, usually a severe lacerated wound. In these cases amputation should be immediate, but if the patient's general condition is not excellent, no operation should be performed.

10. Mortification following ligation or gunshot wound or other irreparable injury of a main artery.

11. Mortification the result of atheroma or embolism in old people (senile gangrene), but only under the very exceptional circumstances that a line of demarcation is unmistakably established and has existed for some time, and the patient's general health and strength are excellent.

12. Aneurism produced by traumatism or suddenly becoming diffuse, particularly if situated in the axilla, in the hand, or between the deep and superficial muscles of the calf.

13. Aneurisms in which secondary hæmorrhage occurs after ligation of the artery, or in which suppuration of the sac is followed by bleeding.

14. Wounds, especially gunshot wounds, of the main vessels of an extremity, as the brachial, femoral, or popliteal, particularly the latter two.

15. Secondary hæmorrhage after either the wound or the ligation of a vessel, where recurrent, and proceeding, as is usual, from the distal end of the vessel.

16. Disorganizing inflammation of joints, with extensive involvement of the bones, or with profound exhaustion of the patient, or where excision has been tried and has failed.

17. Caries or necrosis of bones, involving the entire thickness of the shaft for some distance or implicating all the bones of the carpus or the tarsus.

18. Malignant growths occupying an extremity. After marked involvement of the lymphatics, or reproduction of the disease in other parts of the body, or the development of profound cachexia, no operation is allowable.

19. Ulcers involving immense surfaces, stripping the bone and exhausting the patient by their irritation and profuse suppuration, after all other possible methods of treatment have failed.

20. Malformations or deformities, either congenital or acquired, which render a limb absolutely useless, or even make it a source of continuous pain or discomfort, and which admit of the application of no method of correction.

Having determined in any particular case that amputation is necessary, it remains to decide *when* and *how* to perform it.

The time for amputation is selected according to the condition of the patient. An individual who has received an injury sufficiently severe to necessitate amputation almost invariably, if he survives, passes through certain distinct stages, characterized by definite symptoms. At first he is likely to be cold, pale, with a moist, clammy skin, a feeble, almost imperceptible pulse, a shrunken face, shallow, interrupted breathing, and great muscular prostration. These symptoms, which are those of *shock*, endure for a variable period, usually only a few hours; sometimes, in aggravated cases, for a day or two. They are succeeded by those of *reaction*, which is evidenced by a return of warmth to the body and then to the limbs, of color to the face, force to the pulse, and strength to the muscles. Taken together, the conditions of shock and reaction constitute what is known as the *primary period*, or, in other words, that interval which elapses between the occurrence of the accident or the reception of the injury and the development of the traumatic fever which ushers in what is called the *intermediary period*. The latter extends over to four weeks, and is accompanied by the usual local two and constitutional symptoms of inflammation, swelling, pain and redness of the limb, fever and its concomitants of thirst, anorexia, headache, and sometimes delirium. This is followed by the *secondary period*. The fever subsides, suppuration begins in the wounded part, the tenderness and tumefaction disappear, and the process of granulation is established.

Now, although at one time the subject of dispute, it is no longer open to question that the first of these divisions of time, the *primary period*, is the one best adapted for the performance of surgical operations, and that the latter half of this period should be chosen for that purpose, no amputation being advisable during the persistence of shock. In a few cases, where reaction is long delayed, but has begun to appear, and where it is feared that the patient will, before it is fully established, have entered the *intermediate* or inflammatory period, it will be proper to perform an operation not too grave in its character or too protracted in its performance. If, either through choice or necessity, the *intermediary* period has unmistakably been entered upon, the amputation must be delayed until suppuration makes its appearance—*i. e.*, until the *secondary* period is reached. Amputations performed at this time often do quite as well as though they had been done in the period of selection; but it must be remembered that the patients have in the mean while run great risks, many of which would have been avoided had amputation been employed promptly on the appearance of the symptoms of reaction.

It now remains to study the *methods of amputation*—first, as regards the general principles involved, and next in reference to special modifications required in particular localities.

The essential objects aimed at in all amputations are to sacrifice or remove no structures unnecessarily, the mortality invariably increasing as the trunk is approached; to secure sufficient cutaneous or musculocutaneous covering for the end of the bone, to prevent any subsequent protrusion of the latter; to see that the vascular supply of the flaps is sufficient; to place the cicatrix, whenever possible, in a situation removed from pressure; and, finally, to perform the operation with as little shock and loss of blood as may be consistent with the foregoing requirements. All matters of mere formality should be subordinated to these ends, and consequently no one particular method can be assigned the superiority over all others. In irregular lacerations, such as are frequently seen after explosions, machinery accidents, or gunshot wounds, flaps must be taken from whatever aspect of the limb is most available, and from whatever tissues, provided they have a skin-covering, which can be made to answer the purpose. It is certainly much more important to the patient that the indications for and against the operation should be carefully weighed and balanced, and that, if it be found necessary, the general principles enumerated should be observed, and the subsequent dressing be careful and assiduous, than that any special method, however brilliant, be followed in the actual removal of the limb.

The modes of operating, however, in cases where the surgeon is free to choose, may be classified under the two main heads of—(1st) the *circular* or *tegumentary*, and (2d) the *flap* or *musculo-tegumentary*, method.

In preparing the patient for operation by either of these ways, he should be anæsthetized, covered with a heavy sheet or a light blanket, and brought well to the edge of the bed or table, so that the affected extremity shall project beyond it. The limb having been shaved and entrusted to an assistant, and a tourniquet put in position or the main artery compressed by the fingers of another assistant, the surgeon, if right-handed, takes his position with his left side toward the body of the patient.

If he intends to perform the *circular* operation, he draws the skin well upward with his left hand, and then, bending his knees so as to bring his head more nearly on a level with the affected limb, he carries his right hand, holding a long amputating-knife, around the limb, so that the middle of the blade is applied to that aspect of the limb which faces the operator. He then sweeps the instrument around circularly, rising as he does so, and terminating the incision with the heel of the knife at the point of commencement, cutting through the skin, fat, and superficial fascia down to the deep fascia. He next dissects back the flap, or cuff, of integument until it corresponds in length with two-thirds the diameter of the limb, observing as he does so to keep the edge of the knife directed toward the muscles and away from the skin, so as to divide as few as possible of the nutrient vessels of the latter.

Having reverted the integument, which is held out of the way by an assistant with a retractor, the knife is applied to the limb at the base of the reflected flap, and in the same manner is made to cut through the remaining tissues—the fascia, muscles, and periosteum down to the bone. Then, grasping the portion of the limb to be removed with one hand, he saws through the bone with an even, steady movement, taking care not to raise the distal part of the extremity so as to impede the motion of the saw, or, on the other hand, to depress it so as prematurely to break off the bone, and thus cause splintering.

Sometimes, when a limb is very conical, difficulty will be experienced in folding back the cuff of skin. This may be obviated by making a slit in it on either side, or more elegantly by substituting for the circular tegumentary incision two semilunar cuts, remembering to dissect them up from the subjacent parts for a short distance at the angles of the wound, so as to prevent the projection of the bone after the approximation of the flesh.

In performing an amputation by the *flap* or *musculo-tegumentary* method the preliminary arrangements are of course the same. The flaps may be made equal and similar on opposite sides of the limb (bi-musculo-tegumentary), or may consist of all the soft parts on one side and simply of skin on the other (semi-musculo-tegumentary). With the exception of the skin flap, they may be made either by transfixion or by cutting from without inward.

In operating by transfixion the soft parts are seized in one hand and elevated from the bone, while with the other a long, sharp-pointed amputating-knife is made to enter at the junction of the upper and lower, or inner and outer, halves of the limb. It is carried steadily forward until it touches the bone, over which, by raising or depressing the handle, the point is made to glide, and is then protruded at a corresponding point on the opposite side of the limb. By carrying it downward with a sawing motion, and then cutting obliquely outward, a semi-oval flap is formed; or if the knife is brought directly outward after having cut downward for the necessary distance, a square flap is formed, as in amputation at the elbow. The other flap is made in the same manner by reinserting the knife at one of the angles of the incision and repeating the former procedure.

Where there is an abundance of muscular covering on one side of the limb, as in the upper portion of the calf, one flap may be made in this manner, the second consisting of skin only; or both flaps may be made by cutting from without inward, the knife first cutting the skin, and then passing upward and inward.

To avoid the difficulty occasioned by the greater retraction of the muscles, the skin may be first raised for a short distance, the knife passed across at the angles of the wound below the muscles, and then made to cut downward and outward to the line where the skin flaps are reflected. The Teale method consists in making two rectangular flaps, one of them equalling in length one-half, and the other one-eighth, of the circumference of the limb, the latter containing the principal blood-vessels and nerves.

The incision in the *oval* method may be said to resemble a circular one, in which a slit has been made up one side of the flap and the edges rounded off. It, however, usually includes all the soft parts down to the bone, and is therefore not purely tegumentary. It is chiefly applicable to amputation at the metacarpo- and metatarso-phalangeal joints. Larrey's amputation at the shoulder-joint is the only familiar instance of its employment in more serious operations.

These represent the chief variations in the modes of performing systematic amputations. The surgeon may be compelled to adopt now one, now another, or, as has been stated, may be forced to disregard them all; but where his choice is untrammelled, it may be said that the circular or the modified circular—with semi-lunar incisions—is best adapted for the lower third of the leg and for the forearm near the wrist; the semi-musculo-tegumentary method for the upper portion of the leg; the bi-musculo-tegumentary for the arm, the thigh, and the upper part of the forearm.

In cases where tissues on one side of the limb are involved in the disease or injury to a much greater extent than those on the opposite side, the Teale, or rectangular-flap, method may be advantageously employed. In operations through the joints these methods are modified in accordance with the anatomical conformation of the parts.

The *dressing of stumps* after amputation is by no means an unimportant part of the operation. No brilliancy in the use of the knife, no degree of mere operative skill, can compensate for subsequent neglect. The most successful practitioners in this as in all other departments of surgery have been the most careful in their attention to details, and nowhere is the necessity for this more clearly shown than in the after-treatment of amputations. A poorly-applied bandage, an improper position of the limb, even a misplaced stitch, may give rise to great unnecessary pain and discomfort, to delayed healing, or even to a fatal termination. The general principles to be observed are—

1. Scrupulous cleanliness of everything brought into contact with the surface of the wound—the hands of the operator, instruments, sponges, etc.

2. The absolute cessation of hæmorrhage before the wound is closed, the vessels which are tied being carefully isolated.

3. The disinfection of the wound and its protection from later contamination by the use of some antiseptic dressing.

4. The approximation of the flaps by silver sutures and by pads properly placed so as to avoid the slightest tension.

5. The provision for an unimpeded escape of all subsequent discharges by the use of drainage-tubes, by a dependent position of the end of the stump, and by the employment of absorbent material for dressings.

6. The control of muscular contractions by means of a roller bandage, and the prevention of all movements of the limb.

7. The avoidance of unnecessary interference with the dressings, and when they are changed the continued observance of the above precautions.

After complete healing has occurred and some time has elapsed, the tissues at the end of a stump usually consist chiefly of fibrous tissue, the muscular and fatty elements having largely disappeared; the vessels which have been tied are converted into fibrous cords as high as the first collateral branch, and the ends of the bones themselves will be found rounded off and their canals filled for some distance with compact tissue.

No artificial limb or prosthetic appliance can, as a rule, be fitted to the stump within three months after the operation. The hollow limbs, constructed so as to distribute the pressure over the entire superficies of the extremity above the stump, are to be preferred, and should be constructed from a mould made from a plaster cast. When, from atrophy of the limb, which almost always occurs, they become too large, they should be replaced by new ones or filled up to correspond with the diminution in size of the soft parts.

Except in the case of the leg just above the ankle, the general principle may be enunciated that every inch of the limb that is lost decreases its strength and usefulness, and renders the application of a satisfactory artificial appliance more difficult. As it is desirable, however, that the stump increase in size more or less as the trunk is approached, amputation should be performed in the case mentioned at least three inches above the malleoli, otherwise the stump would have the reverse shape. (J. W. W.)

See Vol. I. p. 692 Am. ed. (p. 789 Edin. ed.).

ANÆSTHESIA, ANÆSTHETICS. It seems necessary to discuss the very important practical question as to the selection of anæsthetics. There are three anæsthetics which are in general use for the purpose of preventing suffering during the performance of surgical operations. Of these, nitrous oxide is certainly the safest. It has been used an enormous number of times, and often by men most ignorant and unskilful; nevertheless, there are but one or, at the most, two deaths fairly ascribable to it. It is, however, unfitted for use in general surgery, on account of the brevity of its action and the rapidity with which the patient recovers from the anæsthetic. If at any time during its administration the inhalation is arrested for one minute, or even less, recovery takes place; and in some few instances in which it has been used in major surgery in Philadelphia the patient has recovered consciousness during the most painful part of the operation. For short operations, such as the extraction of a tooth or the opening of an abscess, it is very well fitted. It requires, however, a cumbersome and expensive apparatus for its use, and consequently it has been almost absolutely relegated to dentists.

Ether and chloroform are the two available anæsthetics for use in major surgery. Bromide of ethyl and some other agents have been brought forward, but experience has proved that they are either untrustworthy or unsafe. Ether is certainly less powerful than chloroform, and less agreeable both to the patient and to the surgeon, since it requires more time for the production of anæsthesia, and its administration is more apt to be accompanied by excitement and struggles and to be followed by nausea and vomiting. Further, in the commencement of the etherization there is often a severe sense of choking or constriction in the throat, and even of impending suffocation, both of which are wanting when chloroform is employed. These disadvantages may in great measure be overcome by proper management, and do not avail against the fact that chloroform is very much more dangerous than ether.

The latest collection of the recorded deaths produced by chloroform, which is brought up to the year 1880, gives the sum-total as 3421, whilst of deaths from ether there have been only 32. The figures given for chloroform deaths are undoubtedly much below the actual number. It requires considerable courage, self-confidence, or devotion to the general interests of humanity for a surgeon to acknowledge publicly that his patient has died from an anæsthetic, and the occurrence is very frequently hidden. Chloroform deaths are so common that the surgeon feels little pressure upon him to record his failure. Ether deaths are, however, so rare that the administrator is much more likely to report the occurrence, especially as he is supported by the conviction that he has not exposed his patient to unnecessary risk. Moreover, during etherization the warnings of danger are much more evident and more prolonged than during chloroformization.

In their general effects upon the system the two agents are very similar, but they are very diverse in their relations to the heart. They both act alike upon the brain, upon the centres of respiration, and upon the spinal cord; but whilst ether is a stimulant to the heart, chloroform is a powerful depressant. During etherization the pulse almost invariably gains in force as well as in frequency, whilst when chloroform is exhibited, though there may be an increase in the rapidity of the pulse, its force is very much lessened. Experiments upon the lower animals have shown that during even prolonged etherization the arterial pressure and the cardiac force are increased, or at least steadily maintained, and only when immense amounts of ether have been given do they begin to flag; whereas during chloroformization the arterial pressure and the force of the heart's beat from the very beginning steadily diminish until they approach zero. The rise in the arterial pressure caused by ether has been proved to be, at least in part, due to a stimulant action upon the heart. If a fluid drachm of ether be injected directly into the jugular vein of a dog, there is no fall in the arterial pressure; whereas twenty or thirty drops of chloroform thrown into the heart through the jugular vein will immediately arrest its action by causing a fatal paralysis. Clinical experience is in accord with these experimental results. The ether death is nearly always through failure of the respiration by the overwhelming of the centres which preside over that function. Chloroform may kill in this way, but in the majority of cases the fatal result has been due to syncope from paralysis of the heart. Failure of the respiration is nearly always preceded for some time by evident irregularity of performance, as well as by cyanosis of the surface; and when present it can be remedied by artificial respiration; whereas the failure of the heart during chloroformization often comes on with intense suddenness, or at the best is preceded by a very short period of feeble pulse, and is irremediable. The surgeon is therefore able to guard against ether accidents much better than against chloroform accidents. No skill, no foresight, can avail against the dangerous powers of chloroform, and very many deaths have occurred in persons of excellent physique about to undergo some trifling operation, such as the removal of a toe-nail, and in not a few cases the victim has been repeatedly chloroformed before without unpleasant symptoms. Great irregularity of the respiration, or a sudden attack of pallor of the face, or marked failure of the pulse, should always be the signal for the withdrawal of the anæsthetic and the adoption of remedial measures. The latter should consist in drawing forward the tongue and the adoption of artificial respiration if that function be at fault. If the patient be in a syncopal condition, he should be immediately inverted at an angle of not less than 45 degrees, his head being downward. By means of the galvanic current, or the cold-water douche, or slapping with a wet towel, or in some other way, the surface of the body should be irritated, so as, if possible, to excite the heart reflexly. Ammonia may be held to the nostrils, or, if the danger be sufficiently urgent, injected directly into the veins. Great care must be exercised in the exhibition of alcohol. Alcohol and ether act upon the organism almost identically, except that ether is more prompt and fugacious in its influence. The resemblance between alcohol and chloroform in their action upon the system is not so close, but is sufficient to require caution. If the nerve-centres or heart be overwhelmed with ether, or even with chloroform, there is great danger that alcohol will add to rather than diminish the existing depression. In the case of etherization the exhibition of alcohol is almost equivalent to giving more of the anæsthetic. There is little doubt that some cases of death which have been attributed to ether have been really due to the enormous quantities of alcohol administered as a stimulus to the heart when that viscus had begun to fail during a prolonged narcotism.

In order to avoid the disagreeable effects of ether the following rules should be carried out in strictest detail. Their observance will, in the majority of cases, render etherization almost as easy to the patient as chloroformization:

First. No food should be taken for five hours preceding the production of anæsthesia, so that the stomach may be completely empty.

Second. The ether should be brought toward the face not too rapidly, and the patient should be fully instructed to breathe with the mouth wide open and to take very full, slow inspirations, with forcible expirations, so as to change as rapidly as possible the residual air of the lungs. It is well to tell him to try to blow the sponge away.

Under certain circumstances the use of chloroform is certainly justifiable, although in the opinion of most American surgeons it is not so ordinarily; thus, in wartime the bulk of ether largely precludes its use during active operations. Then, again, experience has shown that chloroform is less dangerous during labor than when used for surgical purposes, although the statement frequently made that death has never been caused by it during parturition is untrue. When it is imperatively necessary to quiet a violent convulsion with great rapidity, as when immediate asphyxia is threatened during a prolonged tetanic spasm, chloroform may be substituted for ether if the latter be too slow in its action. (H. C. W.)

ANAMOSA, the county-seat of Jones co., Iowa, is at the confluence of the Wapsipinicon and Buffalo rivers, 54 miles S. W. of Dubuque, on the Iowa Midland branch of the Chicago and North-western Railroad, and on the Chicago, Milwaukee, and St. Paul Railroad. There are three iron bridges in the vicinity. The city has four hotels, two banks, two weekly newspapers, six churches, three schools, water-works, and a State penitentiary. There are two flour-mills, wagon- and carriage-factories, a machine-shop, and factories making barbed wire and dairy utensils. It was settled in 1840, and incorporated as a city in 1856. Its property is valued at $98,000, and its public debt is $5400. In the neighborhood are excellent bluestone-quarries, some of which belong to the State. Population, chiefly American born, 2083.

ANATIDÆ (Lat. *anas*, a duck), a family of palmiped lamellirostral birds, including swans, geese, ducks, and mergansers—the "duck family," the only constituent of the sub-order ANSERES, and equivalent to the order LAMELLIROSTRES, minus the PHŒNICOPTERIDÆ (see these three words). It offers the following characters: Bill lamellate—that is, both mandibles furnished along their tomial edges with a series of numerous laminar tooth-like projecting plates, alternating and fitting with one another and with similar protuberances along the sides of the tongue, thus effecting a sort of sieve through which water is strained in search of food. Bill more or less stout, elevated at base, usually widened and depressed at the obtuse end, invested with a tough leathery membrane, and at the end with a hard horny nail, sometimes distinct, sometimes fused with the general covering of the bill. Tongue thick and fleshy, denticulate along the sides, provided with a hard nail underneath at the end. Feet four-toed, palmated, the hind toe elevated, free, and either simple or furnished with a dependent flap. Wings of moderate length (rarely very short), stiff and strong, conferring a rapid and powerful flight. Tail of variable shape, usually short and rounded, many-feathered. Legs short, near centre of equilibrium of the body; position of the body horizontal, or nearly so, in standing and walking; knee buried in the common integument of the body; tarsi scutellate or reticulate, or both. Like the gallinaceous, the anserine type is a familiar one, including all kinds of domestic "water-fowls," which vie with other poultry in point of economic importance, ornament our parks, and furnish exquisite wearing apparel as well as the filling of our pillows and couches.

The anatomical structure is well marked, like the external characters just given. The œsophagus is narrow, and dilates into a well-formed crop; the gizzard is extremely muscular; the cœca coli are long, especially in the herbivorous members of the family. The palate is desmognathous, of the simplest and most direct kind, the flat plate-like maxillo-palatines uniting to bridge over the bony palate. The lacrymal region of the skull is very long; the lacrymal bone is large, and circumscribes much of the rim of the bony orbit; there is a well-ossified interorbital septum, and a long post-frontal process. The premaxillary bone is extensive, its three prongs largely fused together. The roof of the skull often shows large crescentic depressions for lodgment of the nasal gland. The oil-gland is present, tufted. The carotids are two. The ambiens, femoro-caudal and its accessory, and semi-tendinosus, are present. A long penis is developed for more effectual coitus upon the water. There are various curious modifications of the windpipe, which in swans enters a cavity of the sternum, and in many sea-ducks and mergansers expands below into a large, irregular bony labyrinth. There are upwards of 175 species and numerous genera of *Anatidæ*, so closely and variously interrelated that it is not easy to establish sub-families. The following scheme, however, illustrates the leading modifications:

Cygninæ; swans. Lores partly naked. Tarsi reticulate. Sexes alike.

Anserinæ: geese. Lores feathered. Tarsi reticulate. Sexes alike.

Anatinæ: river-ducks. Lores feathered. Tarsi scutellate in front. Hallux simple. Bill flattened. Sexes unlike.

Fuligulinæ: sea-ducks. Lores feathered. Tarsi scutellate in front. Hallux lobate. Bill flattened. Sexes unlike.

Merginæ: mergansers, fishing-ducks. Lores feathered. Tarsi scutellate in front. Hallux lobate. Bill cylindric. Sexes unlike. (E. C.)

Wood-Duck, *Aix sponsa.*

ANATINÆ (Lat. *anas*, a duck), a sub-family of *Anatidæ*, including the river-ducks or fresh-water ducks, distinguished from the sea-ducks (*Fuligulinæ*) by having the hind toe simple instead of lobate. The species are numerous in all parts of the world. The mallard, *Anas boscas*, the well-known original of the domestic duck, is the type of the sub-family. The dusky duck, the pintail, gadwall, various species of teal, are other examples. They are all very closely related, though most commonly placed in genera distinct from *Anas*. The shoveller, *Spatula clypeata*, the mandarin, *Aix galericulata*, and the North American wood-duck, *Aix sponsa*, represent extremes of form. (E. C.)

ANATOMY, HUMAN. The bony *skeleton* not only serves as a basis of support for the soft parts, affording surfaces of attachment for muscles and protection for many delicate organs, but also in the various long bones of the extremities forms levers for purposes of locomotion, movement, and support. As the most permanent and resisting portion of the organism, it contributes greatly to the characteristic shape of the animal; indeed, upon its normal development principally depends the correspondence between the physical appearance of the individual and the archetypal form peculiar to the species to which it belongs.

See Vol. I. p. 700 Am. ed. (p. 799 Edin. ed.).

The bones of the skeleton in the adult are distributed as follows.

Spine, or vertebral column		26
Head	cranium	8
	face	14
	throat (hyoid bone)	1
Thorax, sternum, and ribs		25
Arms, upper extremities		64
Legs, lower extremities		60
Total		198

To these anatomists generally add the two large sesamoid bones called knee-caps (*patellæ*), thus making 200 in all, and occasionally the thirty-two permanent teeth are included; but the latter are more correctly classed with the tegumentary system. The ossicles of the middle ear, three on each side, are also omitted from this enumeration.

Classification of Bones.

The bones are classified as (1) *long*; (2) *short* or *thick*; (3) *flat* or *broad*; and (4) *irregular*. *Long bones* are usually found where freedom of motion is required and where levers are necessary. A distinctive feature of the long bones of the extremities is the existence of an internal or medullary canal which is filled with marrow, red and watery in youth, more dense and fatty in advanced life. Some of the smallest of this group of bones, however, are as broad as they are long. *Short* or *thick bones* are found in the wrist and ankle, where a variety of motions and strength are more required than much range of movement. *Flat* or *broad bones* are found surrounding cavities containing organs which require protection (as in the case of the bones of the skull). *Irregular bones* are those which (like the vertebræ) cannot be classed as either long, short, or flat bones, but partake to a greater or less extent of the functions and characters of several of the classes.

Peculiarities of Special Bones.

The following peculiarities of special bones may be added to their description under their respective headings:

Sacrum.—Running out laterally from the anterior sacral foramina are four pair of grooves for the lodgment of the anterior sacral nerves. As the nerves lie in these grooves, they are protected to a great extent from pressure during parturition, etc.

Occipital Bone.—Separating the two cerebral fossæ on the anterior surface of the occipital bone is a groove for the superior longitudinal venous sinus; and separating the fossæ of the cerebellum is a groove for the occipital venous sinus. The margins of these grooves afford attachment to processes or folds of the fibrous membrane which protects the brain (the *dura mater*), which processes, passing in between the various portions of the brain, separate them from one another, and prevent their injury from concussion during sudden movements of the head.

Sphenoidal Spongy Bones.—The sphenoidal spongy bones, or bones of Bertin, are more generally spoken of by American anatomists as the pyramids of Wistar, after Dr. Caspar Wistar of the University of Pennsylvania. By development they belong to the ethmoid bone rather than to the sphenoid; and in disarticulating the cranial bones they adhere more frequently to the former than to the latter.

Frontal Bone.—The cerebral surface of the frontal bone is divided into lateral halves by a perpendicular groove for the lodgment of the superior longitudinal blood sinus. This groove, beginning below in a small depression called the *foramen cæcum*, lying in front of the deep notch into which the ethmoid bone fits, passes upward and backward along the vertical portion of the frontal bone, the contiguous margins of the parietal bones, and the upper portion of the occipital bone, and terminates at length on the occipital bone at the *torcular Herophili* (*i. e.*, the wine-press of Herophilus, so named in honor of one of the first anatomists known to have dissected the human body). The *foramen cæcum* is not usually a blind hole, as its name implies, but opens below into the cellular air-passages connected with the nose, and affords exit to a small vein from the mucous membrane of the nose, which passes upward to empty into the superior longitudinal blood sinus. Sometimes a very obstinate bleeding from the nose is caused by a rupture of this vein, the blood flowing directly from the sinus, in which the blood-current is then reversed, as there are no valves in the veins of the brain-membranes to prevent such an occurrence.

Temporal Bone, Mastoid Portion.—The cerebral surface of the mastoid process presents a deep groove for the lodgment of the lateral blood sinus of the cranium. This groove commences at the *torcular Herophili*, and runs outward and slightly downward, on either side, over the occipital bone, passing over the posterior inferior angle of the parietal bone and the mastoid process of the temporal bone, and then, curving inward and downward over the jugular process of the occipital bone, ends at the jugular foramen.

Temporal Bone, Carotid Canal.—The canal through which the carotid artery runs in the petrous portion of the temporal bone commences on its under surface, and, turning at a right angle on itself, opens into the cranial cavity at the apex of the bone. This twist in the canal prevents the force of the heart, transmitted through the column of blood, from being expended with too much violence on the soft substance of the brain. The carotid canal is separated from the middle ear by only a very thin plate of bone; consequently, when lying on the side at night we may often hear the beating of the heart, transmitted directly by the blood-current from the heart itself.

Superior Maxilla.—On the nasal surface of the superior maxilla, between the opening of the antrum and the nasal process, is a marked groove running downward from the orbital surface, which is converted into a canal when the other bones of the face are in position, thus forming the nasal duct, which is lined by mucous membrane in the recent state; through it the secretions and tears find their way from the eyes into the nose.

Clavicle.—The double curve of the clavicle increases the quality of resiliency of this bone.

Humerus.—The constriction in the humerus between the head and the tuberosities is called the anatomical neck, in contradistinction to another slight constriction below the tuberosities on the shaft, which is called the surgical neck, because it is the most frequent site of fractures.

Articulations.

Amphiarthrodial Articulations.—By many anatomists amphiarthrodial articulations are classified separately, being placed between the synarthroses, or immovable, and the diarthroses, or movable joints. There would appear to be grounds for a reasonable doubt as to whether an actual synovial membrane ever exists normally, in the human subject, in the centre of the disc of fibro-cartilage of the amphiarthrodial articulation. Where it apparently is present, this appearance may be accounted for, it is said, either by the existence of a thin mass of cartilage-cells which have been softened and broken down, or by maceration, whether in pathological fluids or in the methods of preparation. As synovial membrane is a highly-organized, vascular structure, and as cartilage is non-vascular, a successful injection in such a case of the vessels of the supposed membrane would prove its existence or determine its absence beyond a doubt.

Intervertebral Discs.—There is no true synovial membrane in the interior of human intervertebral substance, although the inner portion is much softer than the outer—so soft, in fact, that it can be readily scraped away with the finger. This soft portion is probably the homologue of the synovial membrane found in this situation in some of the lower animals.

Ligaments of the Spinal Column.—The intervertebral substance is bound to the bodies of the vertebræ by two strong fibrous bands. The anterior common ligament of the spinal column passes down from the axis to the sacrum, being attached to the anterior prominent margins of the bodies of the vertebræ and to the intervertebral discs. The posterior common ligament of the spinal column is a band of fibrous tissue lying in the spinal canal behind the vertebral bodies, and likewise attached to them and the intervertebral discs. The diarthrodial joints formed by the articular processes of adjacent vertebræ are surrounded by capsular ligaments. The intertransverse ligaments are fibrous bands passing between the adjacent transverse processes. They are most marked in the dorsal region, and absent or but slightly developed in the cervical.

Inferior Radio-ulnar Ligaments.—The ligaments of the inferior radio-ulnar articulation, instead of being spoken of as a capsular ligament, are more usually described as the anterior and posterior radio-ulnar ligaments and the triangular plate of fibro-cartilage.

Muscular System.

The muscular system, comprising over 400 individual muscles, presents many points of interest, a few of which only need be mentioned here.

Abdominal Muscles.—The recti muscles are intersected by transverse bands of fibrous tissue, some four or five in number, called the *lineæ transversæ*, which afford attachment to the different sets of fibres of these muscles, thus dividing them into sections. Each of these sections is capable of acting independently of the others, so that a single section may become spasmodically contracted, giving rise to a temporary swelling in a part of the abdomen (hence sometimes called a "phantom tumor") which might be mistaken for a morbid growth. At the outer side of each rectus muscle, where the abdominal aponeuroses, from the external and internal oblique and the transversalis muscles, come together prior to forming the sheath of the rectus muscle, is a white line of fibrous tissue having a curvilinear direction from above downward, which corresponds to the shape of the outer margin of the rectus, and is called the *linea semilunaris*.

Biceps Muscle.—The *biceps flexor cubiti*, on account of its insertion into the bicipital tuberosity of the radius, which is on the inner side of that bone, and into the fascia of the forearm, is not only a flexor of the forearm on the arm, but is also a supinator and a tensor of the fascia.

Extensor Muscles of the Fingers.—The *extensor communis digitorum* divides into three tendons just below the middle of the forearm, the innermost tendon giving off the tendon for the little finger, and the other tendons each going to its respective finger. "The tendons of the middle, ring, and little fingers are connected together as they cross the hand by small oblique tendinous slips." This is the cause of the difficulty experienced in extending the ring finger when the middle and little fingers are flexed, and is a great obstacle in the path of those learning to play upon the pianoforte, as some movements require the ring finger to be raised from the keys while they are being pressed by the other fingers. To obviate this difficulty, Dr. W. S. Forbes of Philadelphia recommends, in aggravated instances, an operation to divide subcutaneously these oblique tendinous slips, and in one case, at least, he has been successful in thus giving a greater degree of motion to this finger.

Nervous System.

Spinal Cord and its Membranes.—The spinal cord ends opposite the body of the first lumbar vertebra in a leash of nerves called the *cauda equina*, from its resemblance to a mare's tail. These nerves pierce the *pia mater*, which is continued down as a slender thread lying in the axis of the sacral canal, and is attached below to the back of the coccyx or to the fibrous membrane which closes below the spinal canal. This slender cord lies within the cauda equina, and is called the *filum terminale* or the *ligamentum centrale*.

The superficial vertical fillets on the posterior surface of the spinal cord, and on each side of the median fissure, in addition to their title of posterior median columns, are often spoken of as the "columns of Goll," and the adjacent portion, from which emerge the posterior roots of spinal nerves, is likewise known as the "column of Burdach." In the interior of the cord the intermediate lateral vesicular tracts near the origin of the posterior cornua, and on each side of the median canal, have been similarly styled "Clarke's columns," after Mr. Lockhart Clarke, who first especially called attention to their structure and function.

Anterior Tibial Nerve.—The anterior tibial nerve is a branch of the external popliteal.

Brain, Corpus Callosum.—On the upper surface of the corpus callosum is a median raphe, on each side of which is a longitudinal ridge of white matter, misnamed the nerves of Lancisi after their describer, but which are part of the structure of the corpus callosum, and not nerves, properly speaking.

Cerebral Convolutions, Localized Centres.—The belief is steadily gaining ground that on the surface of the brain there are what have been called cortical centres for the localization of certain mental faculties—centres situated among the convolutions where vision, audition, tactile sense, articulate language, voluntary motion, and sensation become associated with distinct ideas. This is called "cerebral localization;" it differs materially from what is popularly termed "phrenology," for which, however, it furnishes the only scientific and logical foundation.

We may say—for, although it has not been absolutely proved, yet it may be regarded as approximately correct—that the prefrontal region is pre-eminently the psychical area; that centres for the voluntary motions of the upper extremity of the opposite side reside near the junction of the fissure of Rolando and the superior longitudinal fissure; centres for the lower extremity at the angle behind the above point; centres for the complex movements of the forearm below in the two ascending parietal convolutions; facial centres lower down and reaching to the fissure of Sylvius; centres for the tongue and speech lower still on the third frontal convolution and deeper gyri; centres for vision and ocular movements are in the angular gyri or inferior parietal lobes; hearing, below those of vision, in the posterior part of each superior temporal lobe; smell, in the uncinate gyrus or *subiculum cornu ammonis;* taste, near the preceding; touch, near the base; visual sensation, in the occipital lobe. The locality where ideas are first converted into articulate speech is very probably in the third left frontal convolution, which has been called Broca's convolution, as Paul Broca was the first to demonstrate conclusively the fact that injuries of this region produced loss of speech in whole or in part; this disorder being known as "aphasia."

Organs of Sense.

Facial Nerve, Chorda Tympani Branch.—The chorda tympani branch of the facial nerve does not pass through the Glaserian fissure, as has been described, but through a special canal, the canal of Huguier, which is parallel with the fissure, but is below it, and commences in the middle ear, in front of the aperture for the *membrana tympani*, by a minute orifice, the *iter chordæ anterius*. Besides supplying the submaxillary ganglion and the lingualis muscle, it is distributed to the anterior two-thirds of the tongue, and is connected with the sense of taste in this region. The recent researches of Sapolini apparently prove that this nerve is also very largely motor; he calls it a thirteenth cranial nerve.

Lachrymal Apparatus.—The tensor tarsi muscle arises from the crest of the lachrymal bone, and, passing across the posterior aspect of the sac, it divides into two slips, which are inserted into the tarsal cartilages near the puncta. It may be considered as a deep part of the cillary portion of the *orbicularis palpebrarum*. By its contraction the tears are discharged into the lachrymal canals and forced onward toward the nasal duct.

Internal Ear, Vestibule.—On the inner wall of the vestibule, in front, is a small circular depression, the *fovea hemisphærica,* which lodges the sacculus (a portion of the membranous labyrinth of the internal ear). Behind the fovea is a vertical ridge—the *crista*—which separates it from the opening of the aqueductus vestibuli, and from a small oval depression lying behind it, and in the roof of the vestibule; it lodges the utriculus, and is called the *fovea semielliptica*. Each fovea is perforated by minute holes, called the *macula cribrosa*, for the passage of nerve-filaments.

Tongue.—The taste-buds are now believed not to be essentially connected with the sense of taste, as they are found on the epiglottis, which is not endowed with taste.

Fascia Lata.

The *fascia lata* of the thigh has a structure which enables it to fulfil an important function. The broad fascia in the upper part of the thigh is split into two parts, the pubic and the iliac portions. The pubic portion, lying deeper than the iliac, is attached to the pubic arch at the upper and inner part of the thigh. It is continuous with the iliac portion opposite the lower angle of the saphenous opening, and from this point it passes upward and outward behind the sheath of the femoral vessels, and, covering the pectineus muscle, is attached to the ilio-pectineal line. The femoral vessels therefore rest upon this part of the fascia. The iliac portion is more superficial. It is attached to the iliac crest, Poupart's ligament, and the spine of the pubes. Passing downward and outward from this latter point, it bounds the upper angle and outer margin of the saphenous opening, lying over the femoral vessels, and is continuous below the opening with the pubic portion. These two portions having joined, the fascia passes down the thigh, investing the muscles. The femoral vessels, therefore, in the upper part of the thigh, lie between the two portions of the fascia, resting on one and being covered in by the other; and the saphenous vein, which lies superficial to both portions, can empty into the femoral vein, without perforating the fascia lata, by passing through the saphenous opening. The latter, therefore, is not a mere hole in the fascia, but is formed by the splitting of the fascia and the folding of the two sides of the slit one over the other. (H. M.)

ANCESTOR, generally a deceased person who has preceded another in the line of lineal descent; in law, a deceased person holding the title to real estate from whom, upon his death, that title was derived by descent.

The word "ancestor," as used in law, is by no means confined to persons who have preceded another in the line of lineal descent. It applies equally to collateral relatives from whom real estate is derived by descent.

By the rules of the common law no person was deemed an ancestor from whom title could be derived unless he had been actually *seised* or *possessed* of the real estate in question. By stat. 3 & 4 Wm. IV. c. 360 this principle has been abolished, and any person *entitled* to land is now considered an ancestor from whom title may be derived. A like change in the law has been worked by statute in all of the United States. (L. L., JR.)

ANCHORITE (Gr. *ανά*, back, and *χωρέω*, I give place to) denotes one who has retired from the world. The terms "anchorite" and "hermit" are often used in the same sense, but there was originally a distinction between them, the former signifying a solitary without any fixed dwelling-place, who lived apart from the cloister as well as the haunts of ordinary men, whereas the latter was applied to him who dwelt in a cell attached to some religious house. In course of time the title of hermit was made to include all solitary ascetics, as opposed to that of monk, which belonged to those ascetics who lived in community, practising monastic virtues under a rule and in obedience to a superior called an abbot, and later on in minor houses a prior. The earliest example of the anchorite life is that of St. Paul, popularly called "first hermit," who retired into Upper Egypt in the third century to escape the persecution of Decius. Wild mountains and deserts were the retreats sought by anchorites, in which, left alone with God and nature, they could perform works of penance and combat the flesh and the devil—the world, that other of man's triple enemies, having been left behind them. There they dwelt in pits and caverns, and sometimes they took up their abode in fallen tombs or abandoned sepulchres, secluded from any intercourse with their fellow-men, although not so far retired from their habitations. Water was their drink, and wild herbs, fruits, and berries their food. Such examples of a perfectly eremitical life were comparatively rare, and approved by the Church for those only who were called to it by a divine impulse. Hence it was enjoined by ascetic writers and by councils that none, without presumption, could ordinarily become anchorites or hermits unless the cœnobitic life had first enforced a probationary discipline. The most famous anchorites in the East were St. Paul, St. Anthony, and St. Hilarion, whose life was elegantly written by St. Jerome. In the West this sort of life did not find so many followers, although, strange to say, there were a considerable number in England, some of whom were long held in popular remembrance. (R. S.)

ANCHOVY. As many as seven species of anchovies are found along the coasts of the United States, three occurring on the Atlantic and Gulf seaboard and four on the Pacific. All have been referred to the

See Vol. II. p. 10 Am. ed. (p. 9 Edin. ed.).

genus *Stolephorus*, that name being prior to *Engraulis*. The east coast species are—(1) *S. Browni*, ranging from Cape Cod to Brazil, and very abundant in the warmer waters; (2) *S. Mitchilli*, ranging from Cape Cod to Mexico; and (3) *S. perfasciatus*, a West Indian species, but found occasionally as far northward as Massachusetts. The west coast species are—(1) *S. ringens*, the largest of all; (2) *S. nanus*, a small species; (3) *S. delicatissimus*; and (4) *S. compressus*. These species principally differ in the character of the belly, which may be either roundish or compressed and ridge-like and finely serrated; the width of the body, which may be moderately thick or strongly compressed and translucent in life; and in the number of dorsal and oral rays, as well as color, especially as to the width of the lateral band. The whitish or silvery longitudinal lateral band is present in all the species except *S. ringens*, and the generic name *Stolephorus* alludes to it (στολή, a robe, the English derivative "stole" denoting a band worn by priests, and φορός, bearing). Most of the species are very abundant in fishing-stations, but they have not attained the economical importance of the European anchovy (*Stolephorus encrasicholus*). The Eastern species are rarely specially sought, being neglected on account of their small size; but the California species are caught in large numbers, with other small fish, by the Chinese fishermen.

Under the name "anchovy," besides the genuine species, other fishes of the family of Clupeids are prepared and sold, the common herring (*Clupea harengus*) and sprat (*C. sprattus*) being thus treated in Norway and Sweden, as well as elsewhere. The sprat, indeed, is "prepared mostly as anchovies" in Norway (Widegren in *U. S. Fish Com. Report*, iii. p. 183). The "sea-herring, when tolerably small, is occasionally made into anchovies by less conscientious traders" on the coast of Bohus län, and "more than 5000 tons of small herring have been prepared during the fishing year as anchovies, especially at Strömstad, Fjallbacka, Grafvarne, Lepekie, Uddevalla, Gullholmen, Nösund, Kjrkesund, and Marstrand" in Sweden. "The smaller kind are considered the best for making anchovies, because they have a fine flavor and smaller bones" (Ljungman's report, translated in *U. S. Fish Com. Rep.*, iii. pp. 151, 154). (T. G.)

ANCIENT LIGHTS, in law, windows or openings in the wall of a house or other building which have remained open and unobstructed for a sufficient period to vest in the owner of the premises, by prescription, the right to the uninterrupted enjoyment of the light furnished him by the same. In England the doctrine of ancient lights is one of considerable importance. The unobstructed enjoyment of an ancient light for twenty years will vest an indefeasible title thereto. In the United States it is believed that it may be said generally that such right cannot be acquired by mere user, but only by an express grant. In New Jersey, Illinois, and Louisiana, however, the doctrine of the English law is still in force. (L. L., JR.)

ANDERSEN, CARL CHRISTIAN THORVALD, a Danish poet and archæologist, born Oct. 26, 1826, in Copenhagen, the son of a merchant. His mother being an Icelandic woman, he was sent at the age of nine years to a relative in Iceland to be educated. In 1848 he returned to Copenhagen. After studying law a short time at the university, he turned to literature. He is a very productive author, and he ranks high both as poet and as scholar. He excels in lyric poetry, but he has also given evidence of great power as a prose-writer in his sketches of life in Denmark and Iceland in his large work, *Genrebilleder*, published from 1867 to 1879, 6 vols., which has passed through many editions and been translated into German and other tongues. His *Rosenborg* (1867) and *De danske Kongers Kronologiske Samling* (1870) belong to the field of art and culture; the latter has been translated into German by Lobedanz. From Andersen we also have several collections of Serbian and Icelandic folk-tales and ballads: *Gusle, serbiske Folkesange paa Dansk* (1875), and *Islandske Folkesagn* (1862, 1864, 1877).

ANDERSEN, HANS CHRISTIAN (1805–1875), a distinguished Danish poet and novelist, was born April 2, 1805, in Odense, and died in Copenhagen, Aug. 4, 1875. His father was a poor shoemaker, after whose death his mother sent him in 1819 to Copenhagen, where, after many vicissitudes, he was at length befriended by Siboni, Weyse, Guldberg, and especially by Collin. By the aid of these men he was admitted to the dancing and singing school of the theatre, but when he sought employment in the theatre he was rejected because he was too lean. The above-named men also furnished him means with which to prosecute his studies at the gymnasium. While a student at Slagelse and in Helsingör he attracted attention to himself as the author of several poems, among which was the justly-celebrated *Det döende Barn*, one of the happiest inspirations of his life; and thus he was, in fact, already a poet of reputation when he entered the university in 1828. The same year he published his *Fodreise fra Holmens Canal til Ostkysten af Amager*, a somewhat chaotic association of ideas, partly in the style of Hoffmann, tinged with contempt for all feeling—a trait wholly foreign to Andersen's nature as developed in nearly all his other productions. It became the topic of literary discussion, and was soon followed by his parodical vaudeville, *Kjærlighed paa Nicolai Taarn*, and his first volume of poems. Andersen was a great traveller, and his first journey was made to Germany in 1831. On his return he published his *Skyggebilleder af en Reise i Harzen og det sachsiske Schweiz*. Two years later he visited the Rhine, Paris, Switzerland—where he wrote his dramatic poem, *Agnete og Havmanden*—Northern Italy, and finally Rome. The fruit of this journey was *Improvisatoren*, a novel in which he presents his impressions of Italy, and it effectually silenced all those who prophesied his failure as a poet. The work fully deserves the success it had both in Denmark and abroad. Encouraged by this success, Andersen wrote the following year (1836) the romance, *O. T.*, giving pictures of Northern life, and *Kun en Spillemand*, which is essentially autobiographical. From this time there flowed an unbroken stream of poems, novels, dramas, sketches of travel, and, above all, stories for children, from Andersen's prolific pen. His poems (3 vols.) evince deep feeling, a warm heart, and a vivid fancy. His novels, romances, and sketches of travel also rank high, but he reached the climax of his great popularity in his children's stories. In them he gave his fancy the freest scope, and his wonderful *naïveté*, his fresh humor, and his childlike heart are nowhere more conspicuous. The first volume of these stories appeared in 1836, and their author soon became more widely known than any other Scandinavian poet. They were read on Greenland's shores and on the coast of Africa, in America and in India. The opening story in the volume he published in 1845 is "Den grimme Ælling" ("The Ugly Duckling"), and in it the author gives his own life *in nuce*. Besides the romances already named, he wrote *De to Baronesser* and *At være eller ikke være*. The latter of these must be regarded as a failure. It is a discussion of theological and philosophical problems, to which Andersen was not equal. *I Sverrig* and *I Spanien* are sketches of travel, but the best of all his works of this class is his *En Digters Bazar*, with its magnificent descriptions of scenery and customs in Southern and Eastern Europe. Among Andersen's dramatic works are to be mentioned *Mulatten*, *Den nye Barselstue*, *Liden Kirsten*, *Mer end Perler og Guld*, *Ole Luköie*, and the comedies *Paa Langebro*, *Han er ikke födt*, and *Da Spanierne var her*. The best picture of Hans Christian Andersen's life, of his merits, and of his weaknesses is to be found in his autobiography, *Mit Livs Eventyr*. As supplementary to this the letters to and from Andersen, which have been published, will be found valuable. Andersen's works have been extensively illustrated by the best artists of his own and other countries. In Denmark his works are published complete in twenty-three volumes, in Germany in fifty volumes. The best of his prose works have been published in an American edition of ten volumes, and there are scores of translations and editions in every modern language of his stories for children.

ANDERSON, the county-seat of Madison co., Ind., is on the west fork of White River, 36 miles N. E. of Indianapolis, on the Cleveland, Columbus, Cincinnati, and Indianapolis Railroad. It is also on three other railroads. It has a court-house, four hotels, three banks (one national), three weekly newspapers, four churches, and public and parochial schools. The industrial works comprise two foundries, two flour-mills, three saw mills, a planing-mill, a tannery, and manufactories of portable engines, carriages, wagons, grain-cradles, pumps, barrels, etc. The place was laid out in 1823, and incorporated as a town in 1839, and as a city in 1865. It is well built, and is lighted with gas. Its property is valued at $6,000,000; its public debt is $29,500. The population is 4126.

ANDERSON, the county-seat of Anderson co., S. C., is in the north-western part of the State, 14 miles from the Georgia line, 127 miles N. W. of Columbia, and 145 miles N. E. of Atlanta, on the Blue Ridge division of the Columbia and Greenville Railroad. The Savannah Valley Railroad, now under construction, will connect it with Augusta, Ga. It has a court-house, two hotels, a national bank, a savings bank, two weekly newspapers, seven churches, three schools, an academy, and a female seminary. It has saw-, planing-, and grist-mills, cotton-gins, two carriage-factories, two marble-works, and a tile-factory. It is a handsome town, surrounded by a fertile agricultural country. Its property is valued at $1,200,000, and its yearly expenses are $4000. It was settled in 1827, incorporated in 1833, and again as a city in 1882. It was nearly destroyed by fire in 1845, and was sacked by raiders from the Union army in 1865. Its population, two-thirds white, numbers 1850.

ANDERSON, Martin Brewer, LL.D., an American educator, was born at Brunswick, Me., Feb. 12, 1815. He graduated at Waterville College, Me. (now Colby University), in 1840, and in the following year was appointed tutor of Latin, Greek, and mathematics in the same institution. In 1843 he was promoted to the professorship of rhetoric, which position he held for seven years. During this time he also taught classes in Latin, delivered a course of lectures upon modern history, and pursued a special investigation upon the origin and growth of the English language. In 1850 he removed to New York City, where he became editor and co-proprietor of the *New York Recorder*, a Baptist weekly journal, through the conduct of which he obtained a wide influence in his own denomination. In 1853 he was elected the first president of the University of Rochester, Rochester, N. Y., which position he still holds (1883). By his extensive and varied acquirements and his capacity for personal administration he has obtained a high rank among educators. In connection with his administrative work he has organized courses of instruction upon scientific method, intellectual and moral philosophy, the history of civilization, constitutional law, political economy, art-criticism, and the history of the fine arts. He has also taken an important part in religious matters, delivering sermons in various parts of the country and assisting in the organization and extension of American and foreign missions. In 1868 he was appointed on the New York State board of charities, and as chairman of this board wrote several valuable reports. Among the most important of his writings are the following: a series of articles in the *Christian Review* upon "The Origin and Political Life of the English Race" (1850), "Language as a Means of Classifying Man" (1859), "Berkeley and his Works" (1861), "The Growth and Relation of the Sciences" (1862), and "The Arabian Philosophy" (1862); also educational and religious discourses, including an inaugural address on "The End and Means of a Liberal Education" (1854), and essays on "The University of the Nineteenth Century" (1870), "The Doctrine of Evolution" (1873), "The Right Use of Wealth" (1873), and "Voluntaryism in Education."

ANDERSON, Rasmus Björn, an American author, was born in the township of Albion, Dane co., Wis., Jan. 12, 1846. His father, Björn, a Quaker, came to America in 1836 at the head of a large company of Norwegian emigrants, and settled in Wisconsin in 1841. The son received a common-school education, and after the death of his father, in 1850, was instructed by a Lutheran clergyman and attended a Norwegian college in Decorah, Iowa. In 1866 he was made professor of Greek and modern languages in Albion Academy, and in 1869 became instructor in languages in the University of Wisconsin. In 1875 he was elected professor of Scandinavian languages and literature in the same university. Here also, with the assistance of Ole Bull, he founded a Scandinavian library containing (1883) over 1000 volumes. In order to become better acquainted with the literature and scholars of Northern Europe, he accompanied Ole Bull to Norway in 1872, and again in 1873. At the age of nineteen he began to contribute to the press, and he has written extensively for both American and Norwegian periodicals. In defence of the American common-school system he has carried on an active controversy with the Lutheran clergymen of the North-west. He has contributed to *Johnson's Universal Cyclopædia*, to *McClintock and Strong's Cyclopædia of Biblical, Theological, and Ecclesiastical Literature*, and to *Kiddle and Schem's Year-Book of Education*. His first independent publication was *Julegave* (1872), a selection of Norse stories from Asbjörnsen, Moe, and others. In *Den Norske Maalsag* (1874) he gave an account of the movement to restore the national language of Norway. In his *America not Discovered by Columbus* (1874) he endeavors to prove not merely that the Norsemen had discovered the Western continent long before the voyage of Columbus, but also that the latter had knowledge of the fact. His *Norse Mythology* (1875) is a systematic presentation of the Odinic religion, based on the Eddas and Sagas. It has been favorably received by European as well as American scholars, and has been translated into German and Italian. His *Viking Tales of the North* (1877) is a literary study of the Swedish poet Tegnér's *Frithiof's Saga*, and contains an English translation of the Icelandic Sagas on which the poem is founded, a biography of Tegnér, and an English version of the poem itself by George Stephens. His volume on *The Younger Edda* (1880) contains more of the old Icelandic work than ever had been translated before, and is of special value to the student of that literature. To Miss A. A. Woodward's ("Auber Forestier") translation of Janson's *Spellbound Fiddler* (1879) he contributed an introduction containing an interesting sketch of Ole Bull. He also assisted that lady in the preparation of the *Norway Music Album* (1881), a collection of folk-songs, national airs, and choice pieces from modern Norse composers, giving both English and Norwegian texts. He has also superintended the publication of the authorized American edition of Björnstjerne Björnson's novels (7 vols., 1881–82). In company with Dr. F. W. Horn of Copenhagen he has prepared a *History of the Literature of the Scandinavian North from the Earliest Periods to the Present Time*. He is also engaged on a translation of *The Elder Edda*, a *Guide into Teutondom*, and *Folk-lore Stories from the Norse*. Not only has he been busy with the pen, but he has frequently lectured on Scandinavian subjects. On account of his abundant labors in this field he well deserves the name of "Father of Norse literature in America."

ANDERSON, Robert (1805–1871), an American brigadier-general, was born near Louisville, Ky., June 14, 1805. Both his father's and his mother's ancestors came from England to Virginia in 1635. His father was lieutenant-colonel of the First Virginia Continental infantry, and was wounded at the battles of Trenton and Savannah. At the capture of Savannah by the British in 1780 he became a prisoner, but was afterwards an aide to Gen. La Fayette in the campaign which ended at Yorktown in 1781. After the war he was made surveyor of the Virginia military land district, and located the land given by that State to the officers of the Continental army—their only public recompense for years of service. Col. Anderson then, like many other Virginians, settled in Kentucky. His son Robert graduated at West Point in 1825, and served in the Black Hawk War of 1832. He was afterwards instructor of artillery at West Point, served in the Seminole War, and in 1838 was appointed assistant adjutant-general on the staff of Gen. Winfield Scott, with whom he was always on the most friendly terms. In the war with Mexico he served as captain under Scott, and in a desperate attack in the battle of Molino del Rey, Sept. 8, 1847, he was severely wounded. In 1857 he was promoted to be major of the First artillery, and while he held this rank came the crisis of his career. On Nov. 15, 1860, he was ordered to take command of Fort Moultrie, against which the people of South Carolina were already making hostile demonstrations in anticipation of the attempt to take the State out of the Union. After receiving his instructions at Washington, he arrived at Fort Moultrie Nov. 20, and a few days later made a request for reinforcements. It no doubt had been expected at Washington that an officer of Southern birth and connections (his wife being a Georgian) would at least remain inactive amid the warlike preparations around him. As no reinforcements were sent, Major Anderson waited till the ordinance of secession was passed by the South Carolina convention, and then took the responsibility of transferring his little command of 83 men to Fort Sumter, which occupied an island in the harbor, and, though unfinished, was better capable of defence than Fort Moultrie. The transfer was effected quietly on the night of Dec. 26, the guns at Fort Moultrie being spiked and their carriages burnt. This adroit movement frustrated the plans of the South Carolina secessionists and precipitated a change in Pres. Buchanan's Cabinet. On Jan. 4, 1861, the steamship Star of the West was despatched from New York with 200 men for the relief of Fort Sumter, but the authorities of South Carolina were promptly informed of the departure of the vessel. On entering Charleston harbor five days later, she was fired upon by batteries on Morris Island, though she displayed the American flag. Major Anderson, reluctant to engage in fratricidal strife, refused to open fire, as he had received from the governor of South Carolina no declaration of war. The captain of the vessel, getting no support from Sumter, turned seaward and sailed back to New York. Anderson demanded an explanation from the governor, and when he found the hostile act was authorized by him, reported the whole affair to the Government at Washington. Inducements were now held out to Anderson to surrender the fort, but in vain. No further attempt was made to relieve or assist the beleaguered garrison, but the Southern Confederacy having been organized, Gen. P. G. T. Beauregard took command of the besiegers March 3. Numerous batteries bearing on the fort were erected, and troops and munitions of war were gathered around it. Yet during most of the time a daily mail-boat was permitted to pass to and from the fort, and the garrison received supplies of fresh provisions from Charleston markets. Finally, learning that another attempt was to be made to reinforce Sumter, Beauregard on April 11 summoned Major Anderson to surrender. Upon his refusal a vigorous bombardment was commenced, and continued for thirty-four hours. The guns of Sumter were dismounted, its gates and quarters set on fire, and its men exhausted with continual service. Major Anderson then capitulated (April 14, 1861), on the same terms as had been offered previous to the bombardment, and was permitted to march out with the honors of war. A transport conveyed the garrison to the fleet, which had been lying off the harbor, unable to enter on account of the obstructions. Major Anderson sailed to New York, where he was received with every mark of respect. On behalf of the President the Secretary of War presented to him and to the officers and men under his command the thanks of the nation for their courage and patriotic conduct. In May, Anderson was appointed a brigadier-general and assigned to the command of the department of the Cumberland, and organized the volunteer regiments in Kentucky, but on account of failing health he was relieved six months later. On Oct. 27, 1863, he finally retired from active service, and in 1868 he went to Europe for the benefit of his health. He died at Nice, France, Oct. 26, 1871, and the flag under which he fought at Fort Sumter was buried with him. His publications were text-books which he translated from the French and adapted to American service: *Instructions for Field Artillery, Horse and Foot*, and *Evolutions of Field-batteries of Artillery*. (J. P. L.)

ANDERSON, Rufus, D. D., LL.D. (1796–1880), an American Congregational minister, was born at North Yarmouth, Me., Aug. 17, 1796. His father, Rev. Rufus Anderson (1765–1814), was born at Londonderry, N. H., and became pastor of the Congregational church at North Yarmouth, and afterwards at Wenham. The son graduated at Bowdoin College in 1818, and studied theology at Andover. While a student he was employed under Rev. Jeremiah Evarts, secretary of the American Board of Foreign Missions, and in 1824 was appointed assistant secretary. He was ordained in 1826, but never became a pastor. In 1834 he was made corresponding secretary of the Board, and from that time its work was carried on mainly according to his ideas. He aimed at establishing in the mission-fields self-supporting Christian churches, and considered that the attainment of this object should not only regulate the amount of aid to be given directly, but should restrain what was done in behalf of education and set limits to all missionary labor, so as to leave the completion of the work to the native communities. During his connection with the Board the work steadily increased, the number of mission churches increased tenfold, and the number of converts fifty-fold. He made official visits to Greece and Asia Minor in 1828, and again in 1844; to India in 1854, and to the Sandwich Islands in 1863. His executive ability, his stern devotion to duty, his cheerfulness in adverse circumstances, his shrewd insight into human nature, his abiding faith in God, won the admiration of all who knew him. He always refused a high salary, and when, in 1866, at the age of seventy, unsolicited, he resigned his office, wealthy friends presented him with $20,000 as a testimonial to his faithful, self-denying labors. Even this he gave over to the Board, stipulating that he should henceforth receive whatever was necessary for his support and do whatever he was able. He was made a member of the prudential committee, and was lecturer on foreign missions at Andover Theological Seminary from 1867 to 1869. Until his last hours he showed his devotion to the cause to which he had given his life. He died at Boston Highlands, May 30, 1880. Among his numerous publications were *Observations on the Peloponnesus and the Greek Islands*, 1830; *The Hawaiian Islands, their Progress and Condition under Missionary Labors*, 1864; *History of the Mission to the Sandwich Islands*, 1871; *History of the Missions of the American Board to the Oriental Churches*, 1872.

ANDERSONVILLE, a town of Georgia, on the South-western Railroad, 62 miles south of Macon, chosen by the Confederate authorities during the Civil War as a place of confinement for Union prisoners. It was one of the worst sites that could have been selected: the temperature was extremely variable, passing from

20° in winter to 110° in summer. A clearing was made on a side-hill, the soil being of red clay; at the base was a little brook issuing from an adjacent swamp, with miry bed; the water was very bad. On this open field, extending up the opposite hill, without shade, a space was fenced in, with upright logs twenty feet high, 1540 feet in length by 750 in width. Outside of this was a lower stockade, at the angles of which cannon pointing inward were placed, and along which were thirty-five sentry-boxes. The space between the fence and the stockade was called the *dead line:* the sentinels shot at all who ventured into it, and bloodhounds were used to trace those who tried to escape. From February to August, 1864, there were crowded into this pen 31,693 prisoners. The daily ration for each consisted of two and a half ounces of bacon or beef, one sweet potato, a piece of bread two and a half inches square and thick and made of unsifted meal of corn and peas. Frequently the rations were raw, and there were no means for cooking them. Some of the prisoners dug holes in the slopes to creep into for shelter from sun and rain; rude shanties were made of earth, brush, and sticks. When it rained, in portions of the enclosure the water stood in the form of slush a foot in depth; excrement and filth of all kinds were voided in the brook; it was filled with maggots, and the stench was overpowering. The prisoners were in tatters, shoeless and hatless. The place was swarming with lice and fleas and infested with mosquitoes. During August and September, 1864, three thousand of them were sick; for a time they died at the rate of eight or nine in an hour, without medical or clerical attention. They were buried, without coffins, in quicklime. Many lost their reason and became madmen or idiots. All moral sense seemed suspended; in their necessity they turned against each other; they stole food, clothing, and shelter. During thirteen months there were confined 44,882, of whom 12,462 died. After the close of the war this horrible barbarity was inquired into, and the chief jailer, Capt. Wirz, who acted throughout with great inhumanity, was tried and hanged, although he loudly asseverated that he had in all that he did acted under orders. That there were men so blinded by sectional hatred and so lost to all considerations of humanity as to glory and delight in these tortures, we know; but it cannot be believed that this was the pervading spirit at the South: many Confederate officers denounced them, and it is due to justice to quote the words of Col. Chandler, the inspector-general of the Confederate army, who had been ordered to examine and report on the condition of this prison: "It is a place the horrors of which it is difficult to describe; it is a disgrace to civilization." (H. C.)

ANDERSSON, Carl Johan (1827–1867), a Swedish traveller, was born in 1827 in Elfdalen, in Vermland, where his father, the Englishman Lloyd, was living as a sportsman. In 1849, Andersson accompanied his father to England, where he made the acquaintance of Francis Galton, whom he thereupon accompanied to Africa. In 1853 and 1854 he penetrated alone as far as Lake Ngami, and returned to Europe in 1855, where he gave an account of his journey in a work entitled *Lake Ngami, or Explorations and Discoveries during Four Years' Wanderings in the Wilds of South-western Africa* (2 vols., London, 1855; 2d ed. 1856), which was translated into Swedish by Thomée (Stockholm, 1856) and into German by Lotze (Leipsic, 1857–58). In the fall of 1856, Andersson returned to South Africa, and in 1858–59 he made his way, in spite of the greatest difficulties, to the river Okavango, where he arrived the 22d of March, 1859, and whence he returned to Otjituo. This journey is described in *The Okavango River, a Narrative of Travel, Exploration, and Adventure* (London, 1861; translated into German by Hartmann, Leipsic, 1863). Andersson now settled in Cape Town, where he began an ivory trade. In May, 1866, he started on a new journey of discovery for the purpose of reaching the river Cunene. When he had reached it he was attacked by dysentery, returned to the Ovakuambi region, and died there, July 5, 1867.

ANDERSSON, Lars (1489–1552), usually called Laurentius Andreæ, a Swedish reformer, was born in 1489. He studied theology in Rome, but afterwards visiting Wittenberg, he accepted Luther's teaching. He was archdeacon in Strengnäs when he in the Rigsdag of 1523 won Gustaf Wasa for the principles of the Reformation, which, with the approval of Andersson, were preached by Olaus Petri. Andersson became the king's chancellor, superintended the translation of the New Testament into Swedish (published in folio 1526), and worked energetically and successfully for the introduction of the Reformation in Sweden. He resisted the king's plan of making the Church wholly independent of secular power. In 1540 he was accused of having neglected his duties, and of having concealed a conspiracy against the king. He was condemned to death, but this sentence was afterwards commuted to heavy fines, which he paid, and spent the rest of his life in retirement at Strengnäs, where he died April 29, 1552.

ANDERSSON, Nils Johan (1821–1880), a Swedish botanist, was born Feb. 20, 1821, in Småland. In 1851–53 he accompanied the Swedish expedition around the world in the frigate Eugenie, and described the journey in his *En Verldsomsegling* (3 vols., Stockholm, 1853–54; translated into German by Kannegieser, Leipsic, 1865). In 1856, Andersson became professor of botany and curator of the botanical collections of the Academy of Science in Stockholm. He died there, March 27, 1880. Of his learned works the following are the most important: *Salices Lapponiæ* (Upsala, 1845); *Conspectus Vegetationis Lapponiæ* (Upsala, 1846); *Lärebok i Botanik* (3 vols., Stockholm, 1851–53); *Atlas öfver den skandinaviska Florans naturliga familjer* (Stockholm, 1849); *Cyperaceæ Scandinaviæ* (Stockholm, 1852); *Om Galapagos—Öarnas Vegetation* (Stockholm, 1854); *Inledning till Botaniken* (3 vols., Stockholm, 1851–53).

ANDRÁSSY, Julius or Gyula, Count, an Hungarian statesman, was born at Zemplin, March 8, 1823, of an ancient and noble family. His father was Count Charles Andrássy, distinguished through his efforts to promote the scientific and industrial progress of his country. Count Julius succeeded his father (who died at Brussels in 1845) as president of the society for regulating the course of the river Theiss. In 1847 his native town returned him to the Diet of Hungary, in which his oratorical powers and political tact soon made him a prominent member. He took an active part in the revolutionary movement of 1848 as an adherent of the popular cause, and after the Hungarian Government had fled to Debreczyn in 1849, he was despatched by the "Republic of Hungary" as ambassador to Constantinople. On the defeat of the revolution in the same year, he was condemned to death and hung in effigy, being beyond the reach of the authorities. He continued to reside as an exile in France and England until 1857, when the general amnesty enabled him to return home. In 1860 he was elected a member of the Hungarian Diet, gave a vigorous support to the Deák party, and was nominated vice-president. In 1867, when the Austrian empire was reorganized and the right of self-government restored to Hungary, Andrássy was appointed by the emperor premier of the new Hungarian ministry, and was charged with the department of defence of that country. The most important events of his administration were the civil and political emancipation of the Jews and the raising of a large sum of money to extend and complete the railway system of Hungary. At the general election of 1869 he was unanimously returned by the electors of Pesth as their representative in the Hungarian Chamber. When the Franco-Prussian War broke out in 1870, Count Andrássy expressed, in the name of Austria-Hungary, the firm intention to preserve the strictest neutrality and to prevent all manifestations of sympathy for France which a party in the Hungarian Chambers sought to express. He also promptly recognized the new German empire in 1871. On Nov. 14, 1871, he succeeded Count von Beust as minister for foreign affairs in the Austrian Cabinet, and somewhat later was made chancellor of the empire, being thus brought into close relations with the stirring events which subsequently occurred in Eastern Europe. He took an active part in the formation of the celebrated "Triple Alliance" between Austria, Russia, and Germany. The Eastern Question appeared to be the principal object of this alliance, and the policy of Count Andrássy was to maintain peace while assuring protection to the Christian subjects of Turkey. During the Servian insurrection, and until the moment of the outbreak of the Russo-Turkish War, Austrian diplomacy ranked high in the deliberations of Europe, and the national conferences all had for text "the Andrássy note," expressing the minimum of reforms which the powers should demand from the Porte in favor of the Christians. After the defeat of Turkey in 1878, Andrássy had a difficult *rôle* to play, which he managed with great skill, preserving an attitude at once of reserve and of menace. He took a prominent part in the subsequent proposal for a European congress, and on its meeting at Berlin he nominated Bismarck for the presidency. At the same time, to be prepared for possible events, he demanded from the Chambers an extraordinary subsidy of 60,000,000 florins. The difficulties subsequently experienced in taking possession of Bosnia and Herzegovina obliged Andrássy to expend even more than this amount, and the constitutional party complained of his action. Although the emperor sustained his minister during the long struggle which ensued, Andrássy finally retired (Oct. 8, 1879). He has since had private conferences with Prince Bismarck, the result of which seems to be a still closer alliance between Germany and Austria, favoring the pretensions of the Hapsburgers to an extension of their rule in the Balkan peninsula.

ANDREÄ, Johann Valentin (1586–1654), a German theologian and social reformer, was born Aug. 17, 1586, at Herrenberg, in Würtemberg, where his father labored as Lutheran pastor. He graduated as master of arts in 1603 at the University of Tübingen, of which his grandfather, the famous theologian Jakob Andreä, had been chancellor. After spending several years in travel he returned to Tübingen and completed his studies in theology. In 1614 he was appointed deacon in Vaihingen, and married. The six years of this first pastorate were the most fruitful of his literary career. His writings, chiefly in Latin, were at once satirical in manner and edifying in purpose, the best known being his *Turbo sive moleste et frustra Divagans Ingenium* (1616); his *Invitatio Fraternitatis Christi ad Amoris Candidatos* (1617); his *Menippus sive Inanitatum nostrarum Speculum* (1618); his *Peregrini in Patria Errores* (1618); his *Civis Christianus, sive Peregrini quondam errantis Restitutiones* (1619); his *Mythologia Christiana* (1619); his *Reipublicæ Christiano-politanæ Descriptio* (1619); his *Christianæ Societatis Idea* (1620); and his *Christiani Amoris Dextra porrecta* (1620). None of these books are of considerable size, but all are pithy and pointed in their criticisms of Church and State in Germany, and stand out by their merits from the dreary mass of theological and general literature of that age. None of them made so much sensation as did three anonymous publications which, since Gottfried Arnold's time, and mainly upon his authority, have been ascribed to Andreä. The first was the *Fama Fraternitatis, or Discovery of the Brotherhood of the Laudable Order of the Rosy Cross* (1614); the second, the *Confessio Fraternitatis, or The Confession of the Society and Brotherhood of the Rosy Cross* (1615); the third, *Christian Rosencreutz's Chemical Nuptials* (1616). (Connected with these in its influence is a work called *A Universal and General Reformation of the Whole Wide World* (1614). It was supposed to be from the same pen, but is in truth merely an extract from Boccalini's once-famous *Ragguagli di Parnaso.*) The purpose of these productions was much the same as that of Andreä's acknowledged works. It was to hold up the mirror to contemporary society, that it might behold its own deformities. But the method was different. The author depicts an ideal brotherhood, unruffled by the contentions of controversialists and the intrigues of politicians, pursuing the study of Christian and mystical wisdom for centuries in a world that only now learnt of their existence. The effect was very different from that contemplated by their author. His mystifications were taken seriously. The great host of adepts and spagiric philosophers accepted the account as literally true, undertook the vindication of the Rosicrucians from their theological critics, and by advertisement and otherwise sought admission into the fraternity. He seems to have sought to undo what he had done in his *Turris Babel, sive Judiciorum de Fraternitate Roseæ Crucis Chaos* (1619).

In 1620, Andreä was transferred to Calw, where he spent the best years of his life in trying to realize his ideal of Christian society. He especially tried to naturalize on Lutheran ground the vigorous discipline he had seen among the Reformed at Geneva. He awakened among his people an interest and activity in works of practical benevolence and in the care of the poor and dependent classes. The horrors of the Thirty Years' War had reached Würtemberg, and caused great demoralization as well as suffering. Calw in 1630 was burnt by the imperialist troops. He lost his house and library. Not a third of his people could be gathered to rebuild the town, and many of these had been brutalized by misery. The plague broke out, and more than a third died of it. But his stout heart never failed, and he labored incessantly for the reconstruction of society on its ruins. As better times returned the citizens began to feel what this brave pastor had been to them in their days of despondency. They paid him voluntarily the accumulated arrears of his salary, and added several thousand gulden to recoup his losses in their service.

In 1639 he accepted a call to Stuttgart, refusing a professorship at Tübingen. Here he labored successfully to secure pastors for the hundreds of parishes left destitute by the war, and to restore orderly living among those whom it had demoralized. In promotion of his plan of reform he published his *Theophilus, sive Consilium de Christiana Religione sanctius colenda, Vita temperantius instituenda, et Literatura rationabilius docenda* (1649). His own labors as pastor and preacher were increasing. His salary did not aggregate one hundred and fifty gulden in three years. Only the friendship and patronage of Duke Augustus of Brunswick-Luneburg enabled him to keep the wolf from the door. He published in 1649 his six years' correspondence with the family of this generous prince, under the title *Seleniana Augustalia ab anno 1643 ad annum 1649, adjectis aliquot epistolis Würtembergicis.* Finally, Andreä's health began to give way through excess of labor and of anxiety. His orthodoxy was assailed by the zealots, who had embittered the life of his friend John Arndt. His labors for the Church were thwarted at every turn by the civil authorities, who assumed to have succeeded to the jurisdiction of the Catholic episcopate. Their pretensions he already had assailed in his *Apap proditus* (1631). In 1647 he obtained his release from his functions at Stuttgart, and in 1650 the appointment as Protestant abbot of Bebenhausen. His duties as superintendent of the churches proved too much for his strength. In 1654 he was transferred to the abbey of Adelberg, where he died, June 27, after spending years in a battle with death.

"Could I call any one from the dead," said Spener, "for the good of the Church, it would be Andreä." In many respects he anticipated the great Pietist, and not least by his sympathy with practical Christianity, and even with mysticism.

Andreä wrote an autobiography, which was published first by Leybold in 1799 in a German translation, and then by Rheinwald in 1849 in the original Latin (*Vita ab ipso conscripta*, Berolini, 1849). His life has been treated (1) by Herder in the introduction to his reprint of Andreä's poems (in the *Zerstreute Blätter*, vol. v. 1793); (2) by W. Hossbach, *Johann Valentin Andreä und sein Zeitalter* (Berlin, 1819); (3) by Steinmeyer in Piper's *Zeugen der Wahrheit* (vol. iv.); and (4) by Tholuck in Herzog's *Real-Encyclopädie*.

(R. E. T.)

ANDREÆ, Laurentius. See Andersson. Lars.

ANDREE, Karl Theodor (1808–1875) a German journalist and geographer, was born at Brunswick, Oct. 20, 1808. He was educated chiefly at the University of Jena, though he studied also at Berlin and Göttingen. After taking his degree in 1830, he returned to his native city to prepare himself for a professorship, but having been engaged in political agitation, he found his intended career barred against him. Entering the field of journalism, he became in 1838 the editor of *Mainzer Zeitung*, and resisted the inclination to French rule which still lingered on the Rhine. He was afterwards editor in Cologne from 1843 to 1846, then for two years at Bremen, and then returned to his native city, where he established a newspaper and advocated the German customs union. In 1855 he removed to Dresden, and in 1858 was made consul of Chili. He died at Wildungen, Aug. 10, 1875. His geographical works were numerous and valuable. Those relating to America were especially noteworthy: they comprise—*Nord-Amerika in geographischen und geschichtlichen Umrissen* (1850–51), *Buenos-Ayres und die Argentische Republik* (1856), besides many articles in *Das Westland* and other journals. He established in 1861 the geographical serial *Globus*. which has since his death been edited by Kiepert. In 1859, Andree published an account of recent explorations under the title *Geographischen Wanderungen*, and afterwards a *Commercial Geography* ("Geographie des Welthandels," Stuttgart, 1867–72), which has since been revised by his son Richard. Andree did much to raise geography to its proper place in its scientific culture.

ANDREE, Richard, a German author, son of the preceding, was born at Brunswick, Feb. 26, 1835. He studied science at Leipsic, but from 1859 to 1863 was engaged in business in Bohemia, where he took part in the contest between the Germans and the Czechs. His interest in these questions of nationality and race is shown by his works, *Nationalitätsverhältnisse und Sprachgrenze in Böhmen* (Leipsic, 1871) and *Tschechische Gänge* (1872). A further illustration is his historic and ethnographic chart of the limits of the language of the Lusatian Wends, published at Prague in 1873, as well as his *Wendische Wanderstudien* (Stuttgart, 1874), which shows the connection between the Lusatian and the Sorbian Wends. He has also published some valuable articles in geographical periodicals, an account of his travels in Scotland, *Vom Tweed zur Pentlandföhrde* (Jena, 1866), and a work on Abyssinia.

ANDREW, James Osgood, D. D. (1794–1870), a bishop first of the Methodist Episcopal Church, and after the division of that Church in 1844 a bishop of the Methodist Episcopal Church, South, was born in Wilkes co., Ga., May 3, 1794. He joined the Methodist Church in early boyhood, was licensed to preach, and was admitted to the itinerant ministry by the South Carolina conference, then including most of the States of North and South Carolina, Georgia, and Florida. From that period till 1832 he was constantly engaged in the active work of the Methodist ministry. He was an earnest, strong, emotional, and sometimes eloquent preacher. In 1832 he was elected a bishop by the General Conference which met in Philadelphia. He continued to perform the duties of the episcopal office till the General Conference that met in New York City in 1844. A few months before the meeting of this conference Bishop Andrew married his second wife, Mrs. Leonora Greenwood, of Greensboro', Ga. By this marriage he became connected with African slavery, Mrs. Greenwood being a slave-owner. Great excitement in the Northern conferences followed this marriage, as no bishop till this time had ever been connected with slavery. Bishop Andrew stated to the committee on episcopacy at the General Conference that he had married a wife who had inherited slaves from a former husband, that he had secured them to her by a deed of trust, and that under the laws of Georgia she could not emancipate them if she wished to do so. The great majority of delegates from the free States felt that Bishop Andrew could no longer usefully fill his office in their conferences. After protracted discussion, by a vote of 110 to 68 the following resolution was passed by the General Conference: "*Resolved*, That it is the sense of this General Conference that he desist from the exercise of his office so long as this impediment remains." The delegates from the conferences in the slave States felt aggrieved by this action, and believed that acquiescence in the resolution would destroy their usefulness in their States. This action led to the division of the Methodist Episcopal Church, and to the formation of the Methodist Episcopal Church, South, by a convention which met in Louisville, Ky., May, 1845. This convention was presided over by Bishops Andrew and Joshua Soule. Bishop Andrew continued in the performance of the duties of the episcopal office till 1866, when the General Conference that met in New Orleans relieved him from active service. He died in Mobile, Ala., March 1, 1871. He is buried in Oxford, Ga. Bishop Andrew was a frequent contributor to the periodical literature of the Church. His most important publications are —*Family Government* (1848) and *Miscellanies* (1854). The completest record of him is a volume entitled *Life and Letters of James Osgood Andrew*, by Rev. George G. Smith, A. M. (1882). (A. G. H.)

ANDREW, John Albion (1818–1867), governor of Massachusetts, was born at Windham, Me., May 31, 1818. He graduated at Bowdoin College, studied law in Boston, and was admitted to the bar. He was a man of strong religious feeling, and became a member of the Church of the Disciples in 1841. Though a Unitarian, he delighted in taking part in devotional meetings of other denominations, and was for many years secretary of the Boston Port Society, which sustained Father Taylor, the Methodist sailor-preacher. He became noted for his defence of those who were arrested under the Fugitive Slave law of 1851. Through his prominence as an anti slavery man he was elected to the legislature in 1858. When John Brown, after his raid on Harper's Ferry, was indicted in a State court for treason against the commonwealth of Virginia, Mr. Andrew telegraphed to Washington that he would be responsible for $1000 for the legal expenses of the defence. He thereupon was summoned before the committee of Congress appointed to investigate the affair, and examined by them. In 1860 he was a delegate to the Republican Convention at Chicago which nominated Abraham Lincoln for President. In the same year he was elected governor of Masssachusetts by the largest popular vote ever cast for any candidate, and was annually re-elected till 1866, when he declined the nomination. Though an earnest advocate of peace principles, as soon as he was inaugurated, in January, 1861, he began to provide for war and called upon the governors of the other New England States to join with him. He reorganized the militia, and had them so thoroughly prepared and equipped that within a week after the President's proclamation of April 15, 1861, he had despatched five regiments of infantry, a battalion of riflemen, and a battery of artillery to Washington. He went there himself when his duties would allow, and urged the most vigorous measures in the prosecution of the war. In September, 1862, he attended the convention of the governors of the loyal States at Altoona, Pa., and drew up the address which they presented to the President. In January, 1863, after persistent application, he obtained permission from the War Department to enlist colored troops, and immediately raised the Fifty-fourth Massachusetts regiment, and when the Government refused to give them full pay he was unremitting in his efforts until they obtained their rights. At the close of his last term of office he delivered an eloquent valedictory address, reviewing the work of Massachusetts during the war, showing that she had contributed to the army and navy 160,000 men and expended out of her treasury $27,700,000, paying promptly in gold the interest on all her bonds. At the same time he urged the most generous treatment of the South, declaring that there could be no real reconstruction until the South was guided by intelligent native leaders. In 1865 he presided at the first National Unitarian Convention in New York. In 1866 he resumed the practice of law, but his constitution had been undermined by his incessant labors and anxieties as war-governor. He died suddenly in Boston, Oct. 30, 1867.

ANDREWS, SAMUEL JAMES, was born in Danbury, Conn., July 31, 1817. He graduated at Williams College in Massachusetts in 1839. His first studies were in the law in his native State, where he was admitted to the bar, and was subsequently admitted in the States of New York and Ohio. But he afterwards changed his profession, and was in 1846 licensed in Connecticut as a Congregational clergyman. After being settled over a parish in East Windsor, Conn., for a few years, he was compelled by disease of the throat to give up preaching, and went to Hartford, Conn., where he has since resided. In Hartford he gave himself to various labors, filling for a number of years the post of instructor in Trinity College (Episcopal) in mental and moral philosophy, and also writing for the press. Mr. Andrews in 1868 took charge of the "Catholic Apostolic" congregation in Hartford, which charge he still retains. Mr. Andrews has published but one book, *The Life of Our Lord on Earth, in its Historical, Chronological, and Geographical Relations*, republished in England and translated on the Continent.

ANDROS, SIR EDMUND (1637–1714), an English colonial governor, was born in London, Dec. 6, 1637. His father was an officer of the royal household, and accompanied the royal family in exile. The son distinguished himself in the war with the Dutch, and in 1672 was appointed major under Prince Rupert. In 1674 he succeeded his father as bailiff of the island of Guernsey, but a few months later was made governor of New York, which, after being for a short time in possession of the Dutch, had passed again to the English by the Treaty of Westminster. Andros was well acquainted with the French and Dutch languages, and thoroughly devoted to the interests of the duke of York, with whom he was a favorite. In pursuance of the duke's instructions, he endeavored to extend the limits of his province to the Connecticut on the east and to the Delaware on the west. He also exerted himself to detach the Indian Five Nations from French influence. In 1678, while on a visit to England, he was knighted by Charles II., but after two years he was recalled on complaint of his proceedings in East Jersey. He retired to Guernsey, but when James II. succeeded to the throne an attempt was made to consolidate the colonies of New England into one royal province, and Sir Edmund Andros, who had previously advised this act, was appointed governor-general of the province. Arriving at Boston in Dec., 1686, he demanded a surrender of the charters of the colonies, announcing that all laws should continue in force that were not inconsistent with the laws of England. He was authorized to appoint and remove the members of his own council, and with their advice to make laws, levy taxes, and control the provincial troops. He abolished the general court, restricted the liberty of the press, and endeavored to enforce some of the ecclesiastical laws of the mother-country. Connecticut having refused to surrender its charter, he marched to Hartford with a body of 60 soldiers in Oct., 1687. According to tradition, he was unsuccessful in obtaining the charter, which was carried off by stratagem from the meeting of the assembly by Capt. Joseph Wadsworth and hidden in the famous "Charter Oak" till the downfall of "the tyrant." The secretary of the assembly, by the order of Andros, closed the record by stating that the viceroy had that day (Oct. 31, 1687) taken into his hands the government of Connecticut. A few months later New York and New Jersey were added to his jurisdiction, but he resided chiefly in Boston, and appointed Francis Nicholson lieutenant-governor of New York. The operations against the French in Maine brought on a war with the Penobscot Indians, and excessive taxes were levied on the people of New England. When tidings of the Revolution of 1688 reached Boston the people could no longer be restrained. The magistrates who had been removed by Andros published a proclamation (April 18, 1689) denouncing his tyranny, and the venerable Simon Bradstreet was made governor. Andros and several of his subordinates were arrested and imprisoned. Agents were sent to King William to request the restoration of the charter. Andros twice attempted to escape from confinement, and once got as far as Rhode Island, but was detected and brought back. In July he was sent to England, where formal complaint was made against him, but he was acquitted without a trial. In 1691 he published a *Narrative of Proceedings in New England*, which was republished in London shortly before the American Revolution to show the turbulent disposition of the colonists. Andros had taken considerable interest in the affairs of Virginia, and in 1692 he was made governor of that colony. As its leading men always had been conspicuous for their loyalty to the Crown, the duties of this position seemed likely to prove more congenial to him than his government of the Puritans of New England. He was popular with the planters, and he recommended the introduction of manufactures and the cultivation of cotton. He also took measures for the preservation of documents relating to the early history of the colony. He had brought over the charter of William and Mary College, and his efforts to retain control of the new institution led to difficulties with Rev. Dr. Blair, its founder. The latter, having been appointed commissary by the bishop of London, had entire charge of ecclesiastical affairs, and through his influence Andros was finally recalled in 1698. He was afterwards governor of Guernsey from 1704 to 1706. He died at London, Feb. 24, 1714. The *Andros Tracts*, edited by W. H. Whitmore (Boston, 1868), give an insight into his administration in New England. (J. P. L.)

ANEMONE is one of the best known of flowers, having some of its representatives growing naturally in many parts of the world, and varieties improved by florists cultivated everywhere. It is a good type of the natural order *Ranunculaceæ*, occupying a place between *Clematis* and *Ranunculus*, or the "buttercups." It is one of the famous plants of mythology. Jealous Flora turned Anemone into a flower because Zephyrus showed the nymph some attentions; but the flower would never open till Zephyrus, in the form of the west wind, breathed upon her. The ancient story has followed it through all time and all the world over. The whole family is known as "Wind-flower," and the *Anemone pulsatilla* of Europe is so named from its vernacular name, *pulsatilla*, which is derived from the Latin *pulsare*, and signifies "to be lightly beaten;" that is, beaten by the wind. The Pulsatilla is also called "Pasque-flower," or, as we might say, "Easter-flower," because in Italy it blooms about Paschal or Easter time. The Anemones best known to literature are *Anemone hortensis* and *Anemone coronaria*. Innumerable varieties of great beauty have been raised from these for garden cultivation, and at one time so much attention was given to the raising of these varieties that a standard of beauty was fixed as the perfection of improvement, and the seedlings were regularly bred to it. There are about fifty species described by botanists, and these make a circuit of the whole temperate region of the globe, some pushing into the Arctic Circle, and some, taking advantage of mountain-ranges, wandering towards the tropics. In our country the Carolina Anemone, which finds its most northern limit in Kansas, extends through Arizona to Mexico, Peru, Chili, and Brazil. Like the European species, the Carolina Anemone is found to vary in color, many shades, from white to pink, purple, or violet, having been noted. The Red Anemone (*Anemone multifida*) is found in New York, and travels west to the Rocky Mountains. The Western *Anemone, A. occidentalis*, is confined to the Pacific, and extends up to British America, and is closely allied to the more northern, *A. alpina*. Some are found at great altitudes: *A. Drummondii* has been gathered on Lassen's Peak, as high as 11,000 feet. The best known American species is *Anemone nemorosa*, popularly known as "Wood Anemone," and "Wood Wind-flower." It is one of the few plants that have made a complete circuit of the globe. It has retained a foothold in all its travels. On the Atlantic slope of America it extends southwardly as far as the mountains of North Carolina, and goes westwardly to the Pacific Ocean. Crossing into Asia, it progresses till it again reaches Europe, abounding in England as it does in the Northern United States. The prevailing color is white, but it is often rose, and in Oregon and Washington Territory bright blue flowers have been found.

Anemones have leaf-like organs some distance below the flower on the flower-stalks, known as involucres, which, if close under the flowers, might almost be called a calyx; and some have feathery tails to the seeds, much as *Clematis* has. But modern botanists unite with *Anemone* some genera which have not these characters. *Hepatica* has the involucre so close as to seem very like a calyx, but is now known as *Anemone Hepatica*. *Thalictrum anemonoides* is often called "Rue Anemone." Classically, the pronunciation of *anemone* places the accent on the third syllable, but horticultural usage has the accent on the second—*a-nem′o-né*. (T. M.)

ANGEL-FISH, a name most frequently applied to sharks of the family *Squatinidæ*. These are peculiar for the depressed body, transversely oval head, and especially for the lateral extension of the pectoral fins and the protraction of their basis forward on each side of the head, but separated from it by notch-like intervals. A fancied resemblance, resulting from this structure when viewed from above, to the ideal "cherub" is the cause of the name. Representatives of the family are found in most temperate and tropical seas in favorable localities, but the number of species is uncertain. The common species of the European and North American coasts is *Squatina angelus*. It sometimes reaches a length of five feet or more, but is generally found of less size. Other names are little bullhead shark (at New York), monk, monkey-fish, shark-ray, and fiddle-fish. The name "angel-fish" is also sometimes applied to species of *Chætodontidæ*, which are brilliantly colored.

ANGELL, JAMES BURRILL, an American educator, was born at Scituate, R. I., Jan. 7, 1829. After graduating at Brown University in 1849, he travelled in the Southern States, and subsequently spent some time in travel and study in Europe. In 1853 he was appointed professor of modern languages and literature in Brown University, but resigned this position in 1860 to take editorial charge of the Providence *Journal*. Throughout the eventful years of the Civil War he remained as editor, doing much to direct the current of public opinion in his State. In 1866 he was chosen president of the University of Vermont, and his success in his duties there caused him to be elected president of the University of Michigan in 1869, though he did not accept the position till after a second election in 1871. In the spring of 1880 he received leave of absence in order to accept the post of envoy extraordinary and minister plenipotentiary to China, being commissioned also to procure a revision of the treaties between the United States and China. After eighteen months spent in this important work, he resigned his diplomatic position in Oct., 1881, and returned to resume his educational labors in the University of Michigan. He has published several articles in the *North American Review*, *Bibliotheca Sacra*, and other reviews.

ANGELUS. The angelus is a popular devotion in memory of the incarnation and in honor of the Virgin Mary. It consists of three versicles, each followed by an Ave Maria, and a short prayer to Almighty God at the end of all. It is called the angelus from the opening words in Latin of the first versicle, *Angelus Domini* nuntiavit Mariæ—"The angel of the Lord announced unto Mary." The custom of reciting a certain number of Hail Maries every day was introduced among the faithful by Pope Urban II. in the year 1095 to obtain prayers for the absent crusaders. When the Crusades ended, the devotion languished until it was revived by Pope John XXIII. in the first half of the fourteenth century. He annexed an indulgence for reciting the angelus in the morning, at noon, and at night. A bell specially dedicated to the Virgin Mary hung in most churches, which was called in English "the Ladye bell," and when tolled for this devotion it was called the "ave" bell, or the "Gabriel" bell, but is now commonly called the "angelus" bell. (R. S.)

ANGLER, a name applied to the fishes of the family *Lophiidæ*, and more especially to the *Lophius piscatorius*, in allusion to the slender, rod-like filamentary spine on the snout, which terminates in foliaceous appendages. The fish sometimes lies partly concealed on the bottom, and waves these to and fro, thus attracting smaller fishes; and when one has approached sufficiently near, the angler rises upward and engulfs it in its capacious mouth. Occasionally it assumes a more active *rôle*, and has been known to capture and engorge large aquatic birds; and the name goose-fish, generally given it on the Massachusetts coast, expresses the popular belief that the feat is not uncommon. Other names are bellows-fish (at Newport, R. I.), monk-fish (along the coast of Maine), sea-devil or devil-fish and fishing-frog (at places on the English coast). With the common angler of the North Atlantic (*Lophius piscatorius*), another species (*Lophius budegassa*) occurs in the Mediterranean. Species are also found at the Cape of Good Hope (*Lophius vomerinus*), in the Chinese and Japanese seas (*Lophius setigerus*) and in deep water in the Pacific Ocean about the Admiralty Islands (*Lophius Naresii*). The head is depressed and the mouth enormously large in all the species. (See also DEVIL-FISH and FISHING-FROG in ENCYCLOPÆDIA BRITANNICA.)

ANGORA GOAT. See GOAT, ANGORA.

ÅNGSTRÖM, ANDERS JONAS (1814–1874), a Swedish physicist, was born Aug. 13, 1814, in Westernorrland. He devoted himself to astronomy until 1858, when he exchanged his position at the Upsala Observatory for a professorship in physics. He died June 21, 1874. In his treatise *Optiska Undersökningar* (Stockholm, 1853) he first called attention to the law which is the principal basis of spectrum analysis. He showed that the fixed lines of spectra produced by electric flames are due to the different substances burned or evaporated. About the same time he published an explanation of the so-called Fraunhofer's lines in the solar spectrum, though his discoveries led him to no results. His principal work is *Recherches sur le Spectre solaire* (Upsala, 1868); other works of importance are —*Om de monoklinoedriska kristallernas molekulära konstanter* (Stockholm, 1859); *Sur les Spectres des*

Gas simples (Upsala, 1871); *Mémoire sur la Température de la Terre* (Upsala, 1871).

ANGUS, Joseph, D. D., an eminent English Baptist minister and author, was born at Bolan, near Newcastle, England, Jan. 16, 1816. His ancestor, Henry Angus, is recorded as having become a Calvinistic Baptist in 1620, and the subsequent members of the family have been noted for vigorous health and longevity, as well as strict adherence to their religious principles. Joseph was educated by a Baptist minister at Accrington, Lancashire, then at the grammar-school at Newcastle, whence he followed the head-master, Dr. Mortimer, to London, where he attended King's College. In graduating at Edinburgh University in 1836 he took the first prize in mathematics, in Greek, in logic, in belles-lettres, and the gold medal in ethics and political philosophy. He was also the successful competitor for a prize of fifty guineas for the best essay on the influence of the writings of Lord Bacon. He studied divinity under Dr. Chalmers and at Stepney College. He was ordained pastor of the Baptist church in New Park Street, Southwark, and while here received a prize of a hundred guineas for an essay in reply to Rev. Dr. Chalmers's defence of church establishments. He subsequently secured various other prizes—one for a series of lectures *On the Advantages of a Classical Education as an Auxiliary to a Commercial Education;* another for an essay to be used for missionary purposes in India: this was called *Christ our Life.* Another prize was won in 1861 in connection with the bi-centenary of St. Bartholomew's Day for the best essay on the nature, growth, and representation of the Church. In 1840 he was appointed secretary of the Baptist Missionary Society, and during the next nine years greatly extended its field of labor as well as increased its revenue one-third. In 1849 he became president of Stepney College. This had formerly been a training-school for theological students, but under his direction its advantages have been extended to lay students. His pupils have taken high degrees at the University of London, and have won numerous prizes and scholarships. As a testimonial to his faithful labors the Angus lectureship has been founded, in which topics connected with church history and biblical science are treated by eminent men. In 1852 he received the degree of D. D. from Brown University, Providence, R. I. For several years he was English examiner in the University of London and for the Indian civil service. His most important publications are the *Handbook of the Bible* and *Handbook of the English Tongue.* In these he has condensed the labors of eminent scholars and critics, and presented them in such a form as to make them available to general readers. He has also edited, with notes, Bishop Butler's *Analogy and Sermons* and Wayland's *Moral Science.* He has contributed to the *Eclectic Review*, the *Sunday Magazine*, and other periodicals. He was a member of the New Testament Company for the Revision of the English Bible.

ANHINGA, the darter, snake-bird, or water-turkey, a bird of the genus *Plotus* and family *Plotidæ.* The name is a corruption of the Portuguese *anhina*, this from the Lat. *anguina*, snake-like, from the snaky appearance of these extremely long-necked, sharp-billed birds. They belong to the order *Steganopodes*, in which the feet are totipalmate; that is, all four toes are connected by full webs. The anhinga, *Plotus anhinga*, is a bird of singular appearance, resembling a cormorant, but much more slightly built, with relatively longer neck and straight slender bill, which is serrate toward the end; there is a moderate, naked throat-pouch; the tail is long, stiff, fan-shaped; the plumage is mostly black. Unlike most *Steganopodes*, which are maritime, the anhingas shun the open coast, delighting to dwell in the most impenetrable swamps, where they fly swiftly, perch with ease, and dive with amazing celerity. They are timid and vigilant, when alarmed dropping like a shot from their perch in the tree or bush overhanging the water, and swimming with the body submerged, only the head and neck in sight, thus resembling some strange kind of water-serpent; whence the name. When surprised on the water they have a habit of sinking quietly under, like grebes, with scarcely a ripple of the surface. They feed on fish, which they pursue under water like a cormorant or loon. The nest is bulky, built of sticks in a tree overhanging the water; the eggs are three or four, pale-bluish, with a white chalky incrustation; the young are clothed in white woolly down, and are fed in the nest by regurgitation.

The anhinga is the only American species of *Plotus*, but two or three others inhabit corresponding warm regions of the Old World. The anatomy of these birds is nearly that of cormorants; but there are remarkable peculiarities of the cervical vertebræ in their configuration and the formation of bony pulleys through which pass the tendons of muscles by which the long S-bent neck is straightened. The digestive system is peculiar, the proventricular glands being placed in a compartment separate from the œsophagus, and the gizzard having a special pyloric division occupied by a mat of long stiff hair-like processes of the epithelium, guarding the orifice of the pylorus. (E. C.)

ANI, the Brazilian name of birds of the genus *Crotophaga*, sub-family *Crotophaginæ*, family *Cuculidæ.* They are a kind of terrestrial or semi-arboreal cuckoos, a foot or more in length, of iridescent black plumage, with the toes arranged in pairs, two before and two behind; the bill is remarkable for rising into a high, thin, arched crest marked with several curved oblique grooves. Anis abound in the tropical and semi-tropical parts of America, where they go in troops and are very familiar. Of the few known species, two have been found in the United States—*C. ani* on the South Atlantic coast, even as far north as Philadelphia in one instance, and *C. sulcirostris* in Texas—but they are hardly more than stragglers from the West Indies and Mexico. The most remarkable fact in the economy of the anis is their nidification in an entirely peculiar kind of communism: several members of a flock colonize and build a single huge nest, in which their eggs are all laid and incubated together. This is one of the most exceptional cases of the deviation from normal nidification and oviposition for which birds of the family *Cuculidæ* are noted. (E. C.)

ANNEXATION. Annexation, or acquisition of territory, is accomplished (1) by discovery, occupation, and prescription, or (2) by treaty, including gift, sale, exchanges, and succession, or (3) by conquest. Acquisition of territory by discovery must be followed by occupation practically continuous. One remarkable instance of international difficulty arising from conflicting claims as to priority of discovery was the controversy between the United States of America and Great Britain in reference to the Oregon Territory. These claims were finally adjusted, after a period of thirty years, by the Treaty of Washington of 1846. A dispute between the same Governments as to the ownership of the island of San Juan was referred, by the Treaty of Washington of 1871, to the arbitration of the German emperor, who awarded the possession, Oct. 21, 1872, to the United States. In 1875 long-standing and conflicting claims to the territory lying about Delagoa Bay, arising on the question of discovery and occupation between Great Britain and Portugal, were settled by reference to the President of France, who decided in favor of Portugal.

The cession of Alaska by Russia to the United States is a recent instance of the acquirement of territory by purchase; and the acquisition of Alsace-Lorraine by Germany from France is a conspicuous example of acquisition by conquest. But annexation by conquest of a portion of a nation's territory is almost invariably ratified by convention.

By the ordinary rules of modern international law the annexation of territory involves the assumption by the annexing nation of all the rights and obligations of the territory annexed. (A. P. S.)

ANNIHILATIONISTS, those who believe that the impenitent wicked will be punished with everlasting destruction. They object, however, to the application of the word "annihilation" to their doctrine, insisting that it does not fully express the nature of the issue they raise, and, moreover, brings up a question which they do not undertake to discuss—viz., "What are the essential elements of matter or spirit out of which living creatures are formed when they come into being, and into which they are resolved when they pass out of being and become extinct as living creatures?" It is enough to know that "the composite creature is dissolved, and, as an individual, is destroyed and becomes extinct;" that is, "resolved into the elements from which he was created" (J. H. Pettingell, in *The Life Everlasting*). The history of this doctrine extends back far beyond the era of Christianity. It is as old, perhaps, as the doctrine of immortality, though not extensively held. All discussions on the future of the wicked dead may be ranged substantially under three heads or theories: (1) everlasting punishment; (2) ultimate restoration to holiness and happiness; (3) annihilation or (literally) "everlasting destruction." There are many variations of belief in each of these classes. In the first there are those who hold that while the existence of the lost is unending, it may become unconscious. In the second class there are some who believe that all mankind will be ultimately restored, and others who assert the possibility of a probation after death for those who have not a fair chance to embrace the gospel in the present life, and consequent partial restoration. The third class embraces those who deny the resurrection of the wicked dead, as well as those who believe they will be raised for everlasting destruction or final extinction. All these classes had been fully developed among the Jews in the three centuries preceding Christ, according to Dr. Edward Beecher (*The Doctrine of Scriptural Retribution*). The old Jewish synagogue of Palestine had a place in its theology, to quote Harman's review of Weber's account of the ancient Jewish system of faith in the *Methodist Quarterly Review* (1882), for the doctrine of final restoration and for that of annihilation. The souls of the wicked descend to Gehinnom, either to be purified or consumed by fire. The system of purification is for those who belong to the house of Israel, but the fate of the heathen is destruction. The belief in this restoration for Israel grew out of the view that "all who are provided with circumcision as a sign of the covenant cannot remain eternally separated from God, but suffer penance in Gehinnom, six months in heat and six months in cold." But it would seem that some believed that three classes of Israelites would meet the fate of the heathen—viz., "the adulterer, the one who puts his neighbor to shame, and the one who gives his neighbor a disgraceful name." In the resurrection the righteous only will take part. The heathen fall into Gehinnom as soon as they die, where, with those of the Israelites who have committed the unpardonable offences, they will first suffer torture, but in the end will be completely annihilated. In later times the belief was that Jewish Christians, and the betrayers of the people, and the Epicureans who denied the divine origin of the Torah, will be "punished for all generations." Philo, the famous Alexandrian Jew, nearly contemporary with the apostles, appears to have been an annihilationist.

The modern school of annihilationists, who have risen in the last generation, prefer to proclaim and defend their doctrine under the designation "conditional immortality." They hold that it was plainly taught by Christ and his apostles that "eternal life" is the "gift of God;" in other words, that the righteous or saved only will put on immortality; the lost will perish utterly. They assert that the doctrine of the inherent or natural immortality of the soul was derived, not from the Scriptures, but from Plato, and came into the literature of the Church in the second century. They deny that the apostolic Fathers believed in the everlasting suffering of the lost; where they used the scriptural phrases "everlasting punishment," "unquenchable fire," etc., they used them in the sense of "remediless destruction." Thus, Pettingell, with Canon Constable, divides the early Christian Church into three classes, two of which held to the dogma of universal immortality. In the first class he puts Christ and the apostles, with Barnabas, Hermas, Ignatius, Polycarp, Justin, Irenæus, etc. Athenagoras (d. 190) he places first in the class of those who held to the endless torment of sinners, and is in doubt whether Clement of Alexandria belongs to the third class, universal restoration, or to the first, conditional immortality. He admits a doubt about the justice of putting Justin in the latter class. These claims are denied by many ecclesiastical and doctrinal historians. Dr. Shedd says: "The punishment inflicted upon the lost was regarded by the Fathers of the ancient Church, with very few exceptions, as endless." These exceptions are to be found, he adds, in the Alexandrian school, mentioning Arnobius and Didymus and Gregory of Nyssa among the exceptions. Hagenbach says most of the Fathers regarded punishment as eternal. He admits that some of them, Justin, Tatian, and Theophilus, held that the soul "either acquires immortality as a promised reward by its union with the Spirit and the right use of liberty, or in the opposite case perishes with the body." He says, however, that they were led to this view by acceptance of the trichotomistic theory of human nature and by other reasons. As to whether they meant annihilation or simple loss of consciousness is open, he intimates, to question, and quotes Baur as accepting the latter view. Dr. George P. Fisher says that in the patristic period, embracing the first six centuries, "the doctrine of endless punishment was the prevalent opinion. The idea of the ultimate restoration of all was entertained by a few eminent church teachers, and the notion of an eventual annihilation of the wicked was occasionally broached." He examines the passage on which Irenæus is claimed to believe in the final extinction of the wicked, and contends that his belief in everlasting conscious punishment is not matter of doubt. He admits that there are frequent passages in the patristic writings which seem at first sight to bear the interpretation which some have put on them—namely, that the souls of the wicked will some time cease to be—but he asserts that the real meaning of these citations is that the soul is not self-existent, but is upheld by divine power. Arnobius, near the beginning of the fourth century, is generally considered to be the first to teach plainly the doctrine of annihilation. But he was neither very prominent nor had he eminent disciples; and, as conceded by Pettingell, the school holding to conditional immortality was soon swallowed up by the Augustinian, and the doctrine of endless punishment from the close of the fifth century became an undisputed article of belief in the Church. It seems to be generally admitted that for the next thousand years it was accepted with scarcely a variation. It appears, however, from a decree of the Lateran Council (summoned by Leo X.), that early in the sixteenth century some had begun to question it. The decree condemns "all those who assert that the intellectual soul is mortal."

The intellectual activity and liberty of thought fostered by the Reformation, and the general impulse it gave to re-examination of the whole range of theological topics, gave rise naturally to variations of belief as to future punishment. The entire sect of the Socinians, who, in considerable numbers, were scattered over Europe in the seventeenth century, believed that the wicked would ultimately cease to be; but the great current of thought on this subject, both Protestant and Catholic, ran in the old orthodox channel. There were few writers down to late in the present century who favored the theory of annihilation, but in recent years it has found many adherents and some able advocates. The continental theologians of the evangelical school very generally modify or reject the doctrine of eternal punishment as held in the Confessions of the sixteenth and seventeenth centuries. They hold that the eschatological teachings of the New Testament are fragmentary and prophetic, and that hence precision of statement concerning last things is not possible (*Fisher*). They are inclined to believe that there may be a probation in the next life, before the judgment, for those who have not heard or who have imperfectly apprehended the gospel. Some favor strongly the doctrine of ultimate universal restoration. Schleiermacher opposes able arguments to the dogma of eternal punishment. Neander inclines to accept restoration as a solution of exegetical and psychological difficulties; so also, it would seem, do Lange and Nitzsch. Julius Müller supposes Matt. xii. 31, 32 to teach that all sins except one will be forgiven in the present or in the future. Delitzsch admits the possibility of conversion in the intermediate state, but holds steadfastly to the doctrine of universal immortality. Bishop Martensen, the distinguished Danish theologian, finds both eternal damnation and restoration set forth in the New Testament, and believes that the antinomy must admit of some solution, but is able to give none. From these statements we see that theological thought on the Continent is seeking for a solution more in consonance, as an eminent writer has said, with human feeling than the idea of hell-torments. Many theological writers either positively or potentially teach restoration as an escape from the ethical, exegetical, and psychological difficulties they find in the way of endless conscious punishment. The alternative doctrine, annihilation, has, says Dr. Dorner, "recently found more common acceptance," though Dr. Fisher declares that it has "few adherents among the eminent German theologians." The latter agrees with others in recognizing Rothe as the ablest of the advocates of this view. Besides him there are claimed for the doctrine in Germany Weisse and Schultz; in Switzerland, Petavel, Mittendorf, Malan, Thomas, and Chatelain; in France, Decoppet, Bastide, Pascal, Hollard, and Sabatier; in Belgium, Byse.

In England one of the most prominent advocates of the doctrine of final extinction was John Locke, in the seventeenth century. He held that the sentence pronounced on Adam and the race was literal destruction of body and soul. Those who accept the gospel become heirs of eternal life, while those who reject it will for ever cease to be. Among those who held the doctrine in the eighteenth century were, it is claimed, Dr. Isaac Watts, Samuel Bourne, Bishop Law, Dr. John Taylor (of Norwich), Macknight, and Dr. Dodwell. Archbishop Whately, of the present century, was an earnest supporter of it, believing that the words translated "death" and "destruction" in the Scriptures, and applied to the future of the finally impenitent, are to be understood in a literal sense. Bishop Hampden of Hereford, who died in 1868, was also a prominent supporter of the doctrine. Since the revision of the Articles of Religion in the time of Elizabeth, when the forty-second article, which directly asserted eternal punishment, was, with two others (one teaching the immortality of the soul), left out, Anglican clergymen have not been legally required to hold or teach that doctrine. There has, however, been no considerable divergence from it either toward restoration or annihilation. The ablest representative of the latter school in England is the Rev. Edward White, a Congregational minister, whose *Life in Christ* (first published in 1846, since revised and enlarged) is perhaps the best presentation that has been made of the subject of conditional immortality. When his book first appeared it was received with general condemnation, and he declares that not a nonconformist pulpit in England was open to him. He formed a Congregational society in London, which observed its thirtieth anniversary in 1882. The doctrine of his book is regarded perhaps with more favor than at first, and he can claim as adherents of it a number of Anglican and nonconformist ministers. Among the more prominent of these, as mentioned by Mr. White, are Prof. Stokes of Cambridge; the Rev. R. W. Dale, Birmingham, Drs. William Leask and Joseph Parker, London, and Dr. Hugh Stowell Brown, Liverpool, Congregationalists; Canon Constable, the Rev. Samuel Minton, and the Rev. Walter Dening, of the Church of England; the Rev. J. Denniston, Baptist; Profs. Barlow and Barrett, Dublin; William Laing, Edinburgh. The leading advocates of the doctrine formed in 1876 the Conditional Immortality Association, which has circulated a large amount of literature on the subject. Mr. White claims that there are many secret supporters of the doctrine in the various denominations who do not make open profession of their views, because of fear of proscription and because they shrink from controversy.

In America considerable interest was awakened on the subject by the publications of Henry Grew (about 1835) and of Elder George Storrs, an Adventist. The latter preached six sermons in 1842, in the midst of the Adventist excitement, which were published and obtained a wide circulation. The doctrine taught in these publications—that immortality belongs only to believers in Christ, and that the "second death" pronounced against the wicked means entire extinction—was adopted in a short time by the great majority of the Adventists, who have made it very prominent in their literature. All the Adventist branches, except the Evangelicals, who number only a few thousands, believe that the wicked will be utterly destroyed. (See ADVENTISTS.) They differ, however, in this: One body, the Life-and-Advent Union, believes that there will be no resurrection of the wicked; while the Second-Advent Christians and the Seventh-Day Adventists hold that those who die in their sins will be raised from the unconscious state in which all the dead rest till judgment, and be sent away into the "second death." The ablest writer among the Adventists on this subject was the Rev. Charles F. Hudson, who had been a Congregational minister. He published two books, *Debt and Grace* and *Christ our Life*, in which the doctrine was elaborately set forth. One other small denomination may be classed as Annihilationists, the Christadelphians. They hold that only immersed believers in Christ will be saved, and that all who are not capable of complying with this requirement—including infants and idiots, together with the heathen and all who are not numbered in the Christadelphian ecclesia—will die without hope of resurrection or future life. Those who intelligently reject the gospel as Christadelphians hold it will rise from the dead to be annihilated.

Besides the Adventists and Christadelphians there are many in other denominations who accept the doctrine of conditional immortality. Those in the ministry who have avowed their belief in annihilation, and been thereby brought into public notice, are believed to constitute but a small proportion of the adherents of the doctrine. How widely the belief is held among the laity there is no means of ascertaining. Of the American writers on the affirmative side there ought to be mentioned, in addition to Mr. Hudson, Dr. McCulloh of Baltimore, *Analytical Investigations concerning the Scriptures* (published in 1852); Prof. Charles L. Ives, M. D., *The Bible Doctrine of the Soul* (1877); the Rev. J. H. Pettingell of Philadelphia, *The Life Everlasting* (1882); W. R. Huntington, D. D., of Worcester, Mass., *Conditional Immortality;* William R. Hart of Philadelphia, *The Eternal Purpose* (2d ed. in 1882). Among those who believe that the souls of the wicked will be eventually destroyed may be mentioned Prof. Clement M. Butler, D. D., Philadelphia, and W. R. Huntington, D. D., of the Protestant Episcopal Church; Lyman Abbott, D.D., and J. M. Whiton, Ph. D., of the Congregational denomination; the Rev. Joseph D. Wilson, Chicago, of the Reformed Episcopal Church; C. R. Hendrickson, D. D. (deceased), Baptist; A. M. B. Graham, D. D., Little Rock, Ark., of the Christian Connection; Prof. D. H. Chase of Wesleyan University, Middletown, Conn. The late Dr. Horace Bushnell has also been included in lists of this kind, but perhaps erroneously. In his *Forgiveness and Law* (published in 1874, shortly before his death), he stated his view in these words: "From the known effects of wicked feeling and practice in the reprobate characters we expect that the staple of being and capacity in such will be gradually diminished; and the possibility is thus suggested that at some remote period they may be quite wasted away or extirpated." He does not here deny that mere existence, unconscious existence, may be infinitely prolonged. He distinctly claims that suffering will be reduced with reduced capacity.

The biblical argument for annihilation or conditional immortality (both designations are rejected by Hart in his *Eternal Purpose*, the latter because eternal life is the *gift* of God, and "that which is a gift must necessarily be unconditional") rests upon the statement that the soul, according to the Scriptures, is mortal and destructible. The advocates of the doctrine do not agree as to the nature of man. Mr. Ives and the Adventists adopt the materialistic view, while Canon Constable, the Rev. J. B. Heard, the Rev. J. H. Pettingell, and others hold the trichotomistic theory. They agree, however, that man's soul, according to biblical teaching, is so constituted as to be liable to death. The Scriptures affirm (says Ives) that animals have souls. "Death comes the same to man as to beast, yet in the possibilities of a future life there is a radical difference between man and beast: there is a living again for the former, not for the latter." Mr. Pettingell, who holds the tripartite theory, contends that body, soul, and spirit are essential to man, and when the breath or spirit, which is an emanation from God, and which causes the soul or life to spring up, is withdrawn, all life ceases. All the dead, both just and unjust, "remain under the dominion of death till God shall again breathe into them the breath of life," when "the righteous in their spiritual and glorified bodies" shall "live and reign for ever with Christ; and the unjust" shall "die again the second death, from which there is no resurrection." Mr. Ives asserts that upon a careful examination of the sixteen hundred instances in which the Hebrew and Greek words for "soul" and "spirit" occur in the Bible, he found nowhere, either in the original or in the translation, the soul or spirit characterized as immortal. The doctrine of immortality, he claims, is drawn from the Scriptures only by inference, and he enters upon an examination of various texts relied upon to prove immortality, and denies that, properly interpreted, they give any support to it. Hart asserts that the analogical argument is on the side of destructibility of the soul: "From analogy we learn that other immaterial vital existences perish." The soul itself may lose some of its properties and attributes even in this life. "More than this, we have seen that the vital germ, the living seed, possessing all the powers and qualities which under suitable conditions would enable it to build up a body, does perish by millions for want of those conditions." "The answer of Nature, therefore, to the question, 'If a man die, shall he live again?' is emphatically No."

Now, if the soul is not inherently immortal, not thus universally endowed by God, the way seems open to the end sought by the logical argument—namely, the final extinction of sin in the universe. It is argued by theologians who incline to restoration that God must triumph finally over the hosts of sin; that He cannot tolerate in His universe an eternal dualism and eternal rebellion against him. Some, like Lyman Abbott, and perhaps J. M. Whiton, hold that after those who are not incorrigible obtain in the intermediate state an opportunity to accept the gospel and are restored, the obdurate wicked, whose character has been irrevocably fixed, will be ultimately destroyed. Says Mr. Abbott: "That immortality is the gift of God through our Lord Jesus Christ, that man is mortal and must put on immortality, that only he can put it on who becomes through Christ a partaker of the divine nature, and so an inheritor of Him who only hath immortality, that eternal life is life eternal, and eternal death is death eternal, and everlasting destruction is destruction without remedy or hope of restoration,—this is the most natural as it is the simplest reading of the New Testament."

The position, then, of man, according to those who deny that the Scriptures teach universal immortality, is that his own choice in this life or in the next (for some hold that the grace of God will be active and effective in the intermediate state between death and the judgment) will determine whether he is to enjoy immortality or perish utterly. He is a candidate for immortality. He secures it if he accepts the gospel of Christ. It is communicated, says White, in the regeneration accomplished by the Holy Spirit, "whose gracious inhabitation applies the remedy of redemption" to "good men of every age and generation," and imparts "God-likeness or immortality to the soul by spiritual regeneration, and to the body by resurrection." The change is "from sin to holiness, from mortality to immortality"—a passing from "a corruptible nature into one which is incorruptible in all its parts, physical and spiritual." The Rev. J. B. Heard holds that it is the office of redemption also which makes it possible for the wicked dead to take part in the resurrection. "This survival of the 'soul,'" he says, "we attribute exclusively to the operation of redemption with its graces and corresponding judgments." Thus, "both heaven and hell, the life eternal of the one and the second death of the other, are the results of that meritorious work of Christ." So also Mr. White. The curse pronounced against Adam and the race is executed in such a manner in the first death as to "allow of its [the curse's] reversal by the resurrection of the same man to life, or of its second infliction under the irremediable condition of extinction of both soul and body in hell."

It remains now to state the exegetical argument by which the Scripture texts referring to future punishment are harmonized with the doctrine of final extinction of the wicked. It is held (1) that such passages as "The soul that sinneth, it shall die," "The wages of sin is death," "Sin when it is finished bringeth forth death," and the "second death" spoken of in Revelation, are to be interpreted literally. The terms "eternal life" and "eternal death," as used in the Bible, are in direct opposition. "Life" means more than "God's favor" or "happiness;" "death" means more than the deprivation of that favor or happiness. If the one means continued existence, the other must mean loss of existence. Says Ives: "The word of God recognizes death as the literal loss of life—the first death, when man dies, or loses life, the first time; the second death, when the wicked man loses life a second time after it has been restored to him by a resurrection. In the first as in the second death the word holds the same, its natural, meaning." Thus, the correlative of the conditional immortality declared by Paul in the passage, "To all who, by patient continuance in well-doing, seek for honor and glory and immortality, God will render eternal life," is eternal death, or, as in 2 Thessalonians, "everlasting destruction." (2) This "everlasting destruction," says Ives, is to be wrought literally by fire. The wicked are to be consumed as tares are gathered and burned. In the numerous texts, therefore, which speak of fire, and declare that the wicked shall be consumed, is to be found confirmation of the doctrine of, final and utter extinction. (3) In answer to the argument that such texts as "Depart from me, ye cursed, into everlasting fire," "And these shall go away into everlasting punishment," cannot be harmonized with the theory of literal extinction, it is asserted that the Greek word translated "everlasting" is the same as that translated "eternal," and this word, *aionios*, "does not absolutely involve the idea of eternity," though it is sometimes so applied. The *kolasin aionion* of Matt. xxv. 46, for example, means an "eternal cutting off." But Ives further argues (4) that annihilation is eternal punishment: "The punishment of sin is death, but that death is eternal; therefore the punishment is eternal." The "unquenchable fire" means a fire which will surely destroy, as chaff, what it feeds upon. It does not involve the idea of eternal duration. The passages in Revelation declaring that the "beast and the false prophet" shall be "tormented for ever," "the smoke of their torment ascendeth up for ever and ever," are, on the other hand, examples of texts which are to be interpreted as figurative. "The literal meaning of the poetic symbol is unending destruction."

Concerning the duration of the punishment of the wicked no definite statement is made. The Life-and-Advent Union (Adventist), as has already been stated, do not believe in a resurrection for the wicked at all; consequently, they hold to punishment in no other sense than simply ceasing to be. Rothe, the German theologian, apparently agrees with Arnobius, who was among the first Annihilationists, in holding that the unpardoned will be gradually deprived of sense and being. (H. K. C.)

ANNUITY, in law, a yearly payment of a certain sum of money granted to another in fee, for life or for a term of years, and charged upon the person of the grantor only. A rent differs from an annuity in that it is charged upon and issues out of land. Though this distinction is clear, yet the anomalous character of an annuity has caused much confusion. It has been sometimes called a personal fee, because, though strictly personal estate, it partakes of the nature of real estate, being transmissible as an estate of inheritance, and not passing to the executor upon the death of the annuitant. On the other hand, although it was a personal contract, and so a technical *chose* or thing *in action—i. e.*, a mere right to recover a debt or redress a wrong by a suit at law—yet the rigorous doctrine of the common law forbidding the assignment of such choses in action either never obtained or was very early relaxed with respect to annuities, probably on account of their frequency and the necessity of permitting their free alienation.

See Vol. II. p. 64 Am. ed. (p. 72 Edin. ed.).

The WRIT OF ANNUITY was the early common-law writ to enforce the payment of an annuity. It has long since become obsolete. (J. M. G.)

ANOKA, the county-seat of Anoka co., Minn., is on the Mississippi River, at the mouth of Rum River, 27 miles north of St. Paul. It is also on the St. Paul, Minneapolis, and Manitoba Railroad and the Northern Pacific Railroad. It has a court-house, four hotels, two weekly newspapers, seven churches, and four good school buildings. Its industrial establishments comprise four large saw-mills, two flour-mills, a sash-and-door factory, planing-mill, cooper-shops, and a machine-shop. White men came to Anoka first in 1846; the first permanent settlement was made in 1850; the first school was opened in 1853. It was made a town in 1856, and incorporated as a city in 1878. Population, 2706.

ANONYMOUS (Gr. *α* or *αν* privative, and *ὄνομα*, Æol. *ὄνυμα*, a name—without name), applied as an adjective principally to any literary work of which the author's name is concealed or unknown; also to works whose authors are known, but whose names do not appear upon the title-page, although disclosed in some other way. When a fictitious or assumed name is used the work is called *pseudonymous* (Gr. *ψευδής*, false, and *ὄνομα*, a name), and the name a *pseudonym*. The French call it a *nom-de-plume*, or pen-name; and it frequently attaches to the writer when his own name is well known, as in the cases of "Geoffrey Crayon," "Arthur Pendennis," "Ik Marvel," "Mark Twain," and others. Anonymous writing was little known to the ancients. The poets recited their own verses; the historians and letter-writers began by announcing themselves, instead of subscribing their names.

The object of anonymous writing is manifold and varied. Sometimes it is to secure a fair judgment of the work on its own merits, eliminating personal prejudices from criticism; sometimes it is due to a real diffidence and humility or modesty; but more frequently it is in order to exercise the power of satire, scorn, and abuse without fear of punishment—to lash individuals or the Government seditiously and illegally. Occasionally, it must be said, great evils have been met and combated in this way. Dean Swift's letters signed "M. B. Drapier," for the authorship of which a reward was offered, destroyed Wood's monopoly of copper coinage in Ireland in 1696, and the remarkable letters of "Junius," whose authorship is still a subject of controversy, attacked the king and Government in a savage and libellous manner. The impersonal character of newspapers, expressed by the editorial *we*, is still retained in England and America. On the one hand, it permits men to write fearlessly, printer and publisher only being punishable for libel—a remedy comparatively seldom resorted to; but, on the other hand, it enables men to do work which they would not do under their own names; it takes away the strong restraint of personal responsibility; it permits them to write on one side or the other; to "confute, change hands, and then confute." Thus the press is corrupted. In France articles are avowed by the name of the author. A movement in the right direction has been made in American magazines and reviews, most of which now have their articles signed by the authors.

Among the great anonyms in English literature a special interest attaches to that of Walter Scott, whose Waverley novels were issued without the author's name. He was only "the author of *Waverley*" and "the Great Unknown." As the series increased many guessed the authorship, and it was generally known before he announced it with his own lips at the Theatrical Fund Dinner in Edinburgh in 1827.

Severe edicts have been issued against anonymous and pseudonymous writings by the popes for the protection of religion and sacred things, and by kings to secure their power and prerogatives from irresponsible attacks. It is in a literary point of view of great interest and importance to find out the authorship and motives of anonymous works. It is difficult to make a bibliographic classification of anonymous works: sometimes this is done by taking the first word, and sometimes the first important word, of the title. Barbier has prepared a French *Dictionnaire des Ouvrages anonymes et pseudonymes* (4 vols., 1822–25), in which are included twenty-four thousand works. He says that in every miscellaneous library one-third of the volumes are anonymous. Halkett, the keeper of the Advocates' Library, and Laing of the New College Library, Edinburgh, have prepared a similar dictionary of English anonymous works, of which the first volume appeared in 1882, and the second in 1883.

The term *anonymous* is applied, but less currently, to musical compositions and works of art. (H. C.)

ANSDELL, RICHARD, an English artist, chiefly celebrated for his delineations of animal life. He was born in 1815 at Liverpool. In 1840 he contributed to the exhibition of the Royal Academy A Galloway Farm and Grouse-shooting, and he has been a frequent exhibitor since both at the Royal Academy and the British Institution. At the beginning of his career Ansdell appears to have intended to devote himself to historical painting, and he executed several more or less important historical works, as, for instance, The Death of Sir W. Lambton at Marston Moor, and Mary Queen of Scots Returning from the Chase. His own inclinations, stimulated by the quite obvious preferences of the public and the brilliant success of Landseer, induced him, however, to make a specialty of animal subjects, and he has painted an immense number of pictures in which animals figure prominently, which have been very popular at the exhibitions, and the engravings made from which have enjoyed great favor with the general public on both sides of the Atlantic. In 1861, Ansdell was elected an associate of the Royal Academy, and in 1871 he was made an academician. In 1856 he visited Spain in search of subjects, and the results of his trips were such important works as The Water-carrier, Mules Drinking, Crossing the Ford at Seville, and the Spanish Flower-seller. Among the other works by him which have achieved commendation and popularity are The Death, The Combat, The Shepherd's Revenge, Fox-hunting in the North, The Highland Cattle-Fair, The Wolf-slayer, Turning the Drove, Feeding Goats in the Alhambra, West Highlands, Found, Gathering the Herd, The Intruders, The Anxious Mother, Peat-Gatherers, The Wandering Minstrel, Rejected Addresses, and The Home of the Red Deer. In co-operation with Thomas Creswick, the landscape-painter, he executed The South Downs, The Drover's Halt, and The Park. In the picture by him entitled Feeding the Calves the figures are by Frith. Ansdell has made a number of etchings which have been admired, although he seems never to have conquered all the technical difficulties of the aqua-fortis process. Without possessing the poetical powers of Landseer, and without being the equal of that painter as a master of the brush, Ansdell is an artist of excellent ability, and the great favor which his works enjoy with a considerable portion of the public is well deserved. He always has a subject, and usually an interesting one, which he expresses with distinctness and force. He paints the human figure well, and animals better than almost any other English artist of the present day except Landseer. Ansdell's style is rather formal, and his color dry and unattractive, so that the engravings which have been made from his works quite adequately represent what is best in them. (W. J. C., JR.)

ANSERES (Lat. *anser*, a goose, in nom. pl.), an order or sub-order of birds, generally equivalent to *Lamellirostres*, including the family *Anatidæ*, or swans, geese, ducks, and mergansers, with or without *Phœnicopteridæ*, or flamingoes. The great peculiarity of the latter, in comparison with ordinary anserine birds, should exclude them from *Anseres* proper. The whole may form one order, *Lamellirostres*, divisible into the sub-orders *Anseres* (for the *Anatidæ*) and the *Odontoglossæ* (for the *Phœnicopteridæ*). (E. C.)

ANSERINÆ (Lat. *anser*, a goose), a sub-family of *Anatidæ*, including the geese. The tarsi are reticulate, as in the swans, but the lores are feathered. The neck is intermediate in length between that of swans and ducks; the body is more elevated and less depressed than that of ducks; the legs are longer, the gait is firmer. The bill is short and stout, very high at the base, and little or not dilated at the tip, which is almost entirely occupied by the nail. The species are more terrestrial and herbivorous than ducks, as a rule; the cœca are of extreme length. The sexes are alike as a rule. The typical geese, of the genera *Anser*, *Chen*, and *Bernicla*, are well distinguished from ducks, but other members of the sub-family grade so closely into the *Anatinæ* that it is difficult to draw any dividing line between the two sub-families. (E. C.)

ANSGAR, ANSCHARIUS, or ANSKAR (801–865), "the Apostle of the North," was born of noble Frankish parentage in a village by the monastery of Corbie, near Amiens in Picardy. Here, early devoted by his parents to a monastic life, he acquired learning so eagerly that in the daughter-house of Corvey, founded (813) on the left bank of the Weser, near the site of the modern Höxter in Westphalia, he was appointed rector of the conventual school. He was a pupil of Paschasius Radbert and of Adelhard. He was on a visit to Corbie when the Danish king, Harold Klak, under the persuasion of Ebbo of Rheims, appeared (826) for baptism at Mayence. The enthusiastic monk readily acceded to a request to return with the king, and the Danish mission was founded at Hadeby, near Schleswig. The zeal of the king and the energy of Ansgar awakened the jealousy of the pagan party, and both were expelled in 829. In the same year, when Swedish envoys concluded their embassage to the emperor Louis the Pious by asking for Christian instructors, a fortunate occasion was accorded to Ansgar. After a year and a half of successful labor at Sigtuna, he returned to announce the result to the emperor. Louis at once determined to succor Ansgar's mission; Hamburg was made an archiepiscopal see, and Ansgar consecrated to it at Ingelheim (831), and, with the pallium, received from Gregory IV. a commission to preach the gospel to the northern nations. Deputing the care of the Swedish mission to a coadjutor, Gauzbert, Ansgar repaired to Hamburg; built there a church, a monastery, and a school, and to it and the monastery of Thourout in Flanders, conferred on the frontier diocese as a support and refuge, he gathered (largely by purchase) the Danish youth. An inroading horde of Norsemen in 837 burned Hamburg and desolated the diocese. At the same time a rising of the pagan party expelled the Swedish mission, while his distress was further augmented on the accession of Charles the Bald by the confiscation (842) of the monastery of Thourout. Succored, however, at Ramsloh, by the piety of the Lady Ikia, he was aided to build a monastery there by Louis the German, and upon the death of Leutbert of Bremen the two dioceses were united (848) and the archiepiscopal see transferred to Bremen. Political missions from Louis enabled him to acquire a strong influence over Erik of Jutland, and the Danish standard was again planted at Schleswig. The work of conversion advanced rapidly. Meanwhile, the archbishop had revived for a time (844–850) the Swedish mission in the person of Ardgar, but unable to secure a successor, himself proceeded again (853) to Sweden. Though the hostility of the pagan faction was strong at his arrival, the holy zeal of Ansgar and the commercial instincts of the Northmen prevailed in the assemblies of several districts; toleration was declared, converts flocked in, and churches were built. During his absence in Sweden his friend Erik was killed in a rebellion of the pagan party (856), and under their influence Erik II. for a time banished the missionaries and the Christians were cruelly persecuted. Upon the disgrace of their leader, Hovi, earl of Jutland, however, toleration again ensued, and a second mission was established at Ribe. Ansgar's death occurred Feb. 3, 865. Every five years the archbishop tithed his income afresh, that he might be assured the proper measure was given to the poor; his charity founded a hospital at Bremen, and he, by an earnest effort, succeeded in suppressing the slave-trade in North Albingia. Besides some devotional works, he wrote a life of Willehad, first bishop of Bremen (printed in Pertz, ii., and *Patrologia*, cxviii.), and a journal of his own missions, known to have been sent to Rome in the thirteenth century, and often sought for in vain.

See Rimbert, *Vita S. Anskarii*, in Pertz, *Monumenta Germaniæ Historica*, ii. (Hanover, 1826, seqq.); in Mabillon, *Acta Sanctorum Ordinis S. Benedicti* (Paris, 1668–1701); also, with many documents, in the *Acta Sanctorum* (Feb. 3; reprinted Paris, 1860, seqq.). There may be consulted also Dahlmann, *Geschichte Dänemarks* (Hamburg, 1840–43), and his notes on Adam of Bremen's *Gesta Hammaburgensis Ecclesiæ Pontificum*. (P. H. H.)

ANSONIA, a manufacturing borough of New Haven co., Conn., is on the Naugatuck River, 12 miles north of Long Island Sound. It is on the Naugatuck Railroad, and is the terminus of the Derby road, 12 miles long, which connects it with New Haven. It has three hotels, a bank of deposit and savings bank, a weekly newspaper, five churches, and several excellent schools. Its mills, using both water and steam, manufacture chiefly metal goods in brass and copper. There is also a very large iron-foundry and machine-shop. Recently attention has been given to electrical goods, and many articles of this class are sent out to all parts of this country and to Europe, while new experiments are expected to give additional importance to this branch of manufacture. The extensive mill of the Postal Telegraph Company is also located here. Ansonia is incorporated as a borough. Its population, by the census of 1880, was 3855.

See Vol. II. p. 89 Am. ed. (p. 100 Edin. ed.).

ANTELOPE, American, or Prong-horn, a ruminating artiodactyl quadruped, with hollow yet deciduous horns, peculiar to North America, type and only member of a family *Antilocapridæ*; the *Antilocapra americana*, Ord. Though universally called "antelope," it has not much in common with the Old-World antelopes, but rather represents in America the giraffe or camelopard (of the family *Giraffidæ*).

This remarkable animal was long the subject of much misconception in various particulars,—respecting its physical characters, physiological processes, and place in the zoological system; few large quadrupeds, equally abundant and in a popular sense equally well known, having furnished occasion for so many grossly inaccurate statements. It abounds in Western North America, from the Plains to the Pacific and from British America into Mexico. I shall endeavor to give its history and habits in full, together with its zoological characters.

Synonymy and Bibliography.

Teuthlalmaçame, Hernandez, *Nov. Hispan.*, 1651, p. 324, fig. 324.

Squinaton, Dobbs's *Hudson's Bay*, 1744, p. 24.

Apistochickoshish, Umfrev., *Hudson's Bay*, 1790, p. 165.

Cabree, or Missouri Antelope, Le Raye's *Journ.*, Boston, 1812, p. 186, fig. (original notice and extraordinary figure).

Antelope, Lewis and Clarke, *Trav.*, 1st Am. ed., ii., 1814, p. 169 (original notice, in part the basis of the first scientific name given).

Antilope americana, Ord, *Guthrie's Geog.*, 2d Am. ed., ii., 1815, pp. 292, 308 (first scientific name; based on Lewis and Clarke); Harl., *Fn. Amer.*, 1825, p. 250 (compiled general notice); Godm., *Am. Nat. Hist.*, ii., 1831, p. 320, pl. (compiled general notice and recognizable figure); Doughty's *Cab. Nat. Hist.*, ii., 1833, p. 49, pl. 5 (compiled notice; fig. from Lewis and Clarke's specimen); Maxim., *Reise*, i., 1839, p. 403.

Antilocapra americana, Ord, *Journ. de Physique*, lxxxvii., 1818, p. 149; *Bull. Soc. Philom.*, 1818, p. 146 (institution of the genus); Say, Long's *Exped. R. Mts.*, i., 1823, pp. 363, 485; Gray, *Knowsl. Menag.*, 1850, p. 19; Gray, *P. Z. S.*, 1850, p. 137; Aud. & Bachm., *Quad. N. A.*, ii., 1851, p. 193, pl. 77; Marcy, *Rep. Expl. Red River*, 1852, p. 201; Baird, *Agric. Rep. Patent Office for 1851, 1852*, p. —, pl. —; Woodh., *Rep. Expl. Zuñi and Colorado Rivers*, 1854, p. 56; Gray, *P. Z. S.*, 1855, p. 10, fig. —; Baird, *Mamm. N. A.*, *Pacific R. R. Reps.*, viii., 1857, p. 666, pl. xxv.; Newberry, *Pac. R. R. Reps.*, vi., 1857, p. 70; Suckl. and Gibbs, *Nat. Hist. Wash. Terr.*, 1860, p. 136; Hayden, *Tr. Am. Philos. Soc.*, xii., 1862, p. 150; Bartlett, *P. Z. S.*, 1865, p. 718 (affinities); Canfield, *P. Z. S.*, 1866, p. 105 (shedding of horns); Sclater, *Ann. Mag. Nat. Hist.*, xviii., 1866, p. 401; Tenney, *Man.*, 1866, p. 101; Coues, *Am. Nat.*, i., 1867, p. 537; Von Martens, *Zool. Gart.*, ix., 1868, p. 287 (horns); Cooper, *Am. Nat.*, ii., 1869, p. 537; Hinman, *Am. Nat.*, ii., 1869, p. 659 (shedding of horns); Murie, *P. Z. S.*, 1870, p. 334, with nine figs. (anatomy); Allen, *Proc. Bost. Soc. Nat. Hist.*, xvii., 1874, p. 40; Allen, *Bull. Essex Inst.*, vi., 1874, pp. 48, 56, 60, 64; Coues & Yarrow, *Rep. Expl. W. 100th Merid.*, v., 1876, p. 69; Caton, *Ant. and Deer of N. A.*, 1877, p. 21, figs. (full account).

Dicranocerus americanus, Turner, *P. Z. S.*, 1850, p. 174.

Cervus hamatus, Blainv., *Bull. Soc. Philom.*, 1816, p. 73.

Cervus bifurcatus, Rafinesque.

Antilope furcifer, Ham. Smith, *Trans. Linn. Soc.*, xiii., 1822, p. 28, pl. 2; *Isis*, 1826, col. 93; Desm., *Mamm.*, ii., 1822, p. 479; Griffith's *Cuv. An. Kingd.*, v., 1827, p. 323; Richardson, *Fn. Bor.-Am.*, i., 1829, 261, pl. 21; Fischer, *Syn.*, 1829, p. 481; Wagner, *Suppl. Schreb.*, v., 1836, pl. 279A; Giebel, *Säugth.*, 1855, p. 305.

Mazama furcifer, Ogilby, *P. Z. S.*, 1836, p. 121.

Dicranoceros furcifer, Sundev., *K. Svensk. Vetensk. Handl.*, 1844, p. —; *Arch. Skand. Beit.*, ii., 1850, p. 268.

Antilope furcifera, Martin, *Zool. Gart.*, v., 1864, p. 254 (horns).

Antilope palmata, Ham. Smith, *Trans. Linn. Soc.*, xiii., 1822, p. 31, pl. 3; Desm., *Mamm.*, ii., 1822, p. 479; Fischer, *Syn.*, 1829, p. 481; Griffith's *Cuv. An. Kingd.*, v., 1827, p. 323; Ogilby, *P. Z. S.*, 1836, p. 121; *Philos. Mag.*, xi., 1837, p. 126; Wagner, *Suppl. Schreb.*, v., 1836, p. 1250, pl. 244D*.

Antilocapra anteflexa, Gray, *P. Z. S.*, 1855, p. 10, fig.

Pronghorn Antelope, Hays, *Am. Nat.*, ii., 1868, p. 131, figs. and pl. 3 (shedding of horns).

Prong-buck, Bartlett, *P. Z. S.*, 1865, p. 718; Caton, *Trans. Ottawa Acad. Nat. Sci.*, 1868, p. 8.

Prong-horn Buck, Gray, *Ann. Mag. Nat. Hist.*, xviii., 1866, p. 323.

American Antelope or Prong Buck, Caton, *Am. Nat.*, x., No. 4, Apr., 1876, p. 193, figs. 10-13; *Amer. Sportsm.*, viii., No. 5, Apr. 29, 1876, p. 65, 8 figs.

Cabree, Cabri, Cabrit, Canadian voyageurs.

Berendo, Mexicans.

General History.—As indicated by the foregoing synonymatic list of references, the prong-horn has been nominally known for more than two centuries. The original notice of the animal is ascribed, no doubt correctly, to Hernandez. Up to the beginning of the present century the quadruped figures repeatedly in accounts of travellers under a variety of barbarous Indian names, some of which are given above, that of "cabree" (spelled also "cabri" and "cabrit") being that by which it was best known to the Canadian voyageurs, and which is still retained to some extent. The earliest use of the term "antelope" (which so long misled naturalists) that I have happened upon occurs in a *Topographical Description of the State of Ohio*, etc., by a late officer of the U. S. army (Boston, Charles Williams, 1812), containing, among other things, "an interesting journal of Mr. Charles Le Raye while a captive with the Sioux nation on the waters of the Missouri River." Under date of July 19, 1801, Le Raye speaks of the "cabree" (p. 187). Facing p. 118 is a plate entitled "cabree or Missouri antelope," representing an impossible animal with very long, slender, sharp, horizontal and nearly straight horns. This is obviously a corruption of the Fr. *cabri*, a kid, Sp. *cabra* (*f.*), *cabron* (*m.*), Lat. *capra*, a goat, transferred, like so many other names of animals, from its original to a new application—just as the English-speaking travellers about the same time applied the word *antelope*, of equally classic derivation and remote original signification. The latter designation occurs in the famous narrative of Lewis and Clarke, first fairly published in 1814, and has remained of universal application by travellers, frontiersmen, and hunters in the West. The animal to-day, in fact, is scarcely known to Americans by any other name, outside the books.

To the intrepid travellers last mentioned we owe the first specimen which appears to have reached the hands of naturalists and served as the basis of a scientific description and designation. Material from Lewis and Clarke's expedition, deposited in Peale's Museum in Philadelphia, was the basis of the figure in Doughty's *Cabinet of Natural History*; and Mr. George Ord was enabled, from the same results of Lewis and Clarke's expedition, to name and describe the species. He first called it *Antilope americana* in *Guthrie's Geography* (2d Am. ed., 1815), and that name held with different writers for many years. Almost immediately, however, Mr. Ord instituted the genus *Antilocapra*, retaining his original specific designation of *americana*. The great French naturalist, De Blainville, is said to have named it *Cervus hamatus* in 1816; but if so, this, as well as the two names imposed by Hamilton Smith in 1822 (*Antilope furcifer* and *A. palmata*), is clearly antedated by Ord's designation. The animal was in succeeding years referred to the genera *Cervus*, *Mazama*, and *Dicranocerus* (the latter applied by Hamilton Smith in Griffith's *Cuvier*), for which procedure there is, however, neither warrant nor occasion. Besides the two species attempted to be established at its expense, J. E. Gray named *Antilocapra anteflexa* upon the unusual curve of the horns of a specimen he inspected. None of these designations, however, deserve consideration, there being unquestionably but a single genus and species. The date of introduction of the term "prong-horn" I have been unable to discover; it has, however, been in use for many years. During the whole period above noted the *Antilocapra* was referred to the family of the antelopes (*Bovidæ*) or that of the deer (*Cervidæ*), but especially the former, as it was known to be a "hollow-horned" ruminant, with a bony core supporting the horny sheath. The discovery that the horns are deciduous was made—or at any rate first communicated to naturalists—by Dr. C. A. Canfield of Monterey, Cal., April 10, 1858. The fact had indeed been perfectly well known to hunters and Indians long before. Audubon was assured of it when on the upper Missouri in 1843, but "managed to prove" to his informants that it could not be so. In fact, so well satisfied were naturalists that no "hollow-horned" ruminant could drop its horns, that Dr. Canfield's communication, made to Prof. S. F. Baird of the Smithsonian Institution, was not published for some years—not until after the actual shedding had been witnessed in the gardens of the Zoological Society of London, and published by Mr. A. D. Bartlett, the superintendent of the gardens, in 1865, as above cited. This of course brought up Dr. Canfield's original account, which was first published in the same society's *Proceedings* in Feb., 1866 (p. 105). In 1868, Hon. J. D. Caton communicated Mr. Bartlett's discovery to the Ottawa Academy of Natural Sciences, unaware at the time of Dr. Canfield's priority of observation. The same year Mr. W. J. Hays fully corroborated the facts, which he illustrated with excellent figures, in the *American Naturalist*, as above cited; and later, in the same volume of the same magazine, Mr. W. M. Hinman adduced independent observations to the same effect.

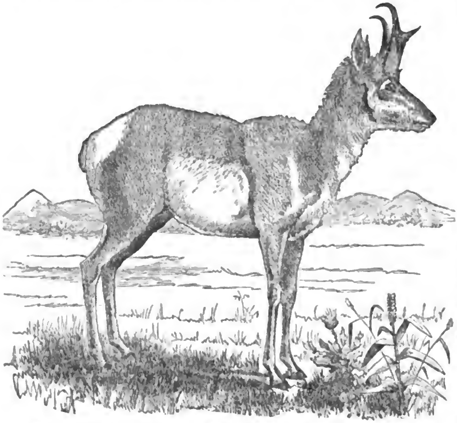


Fig. 1.—Prong-buck (from Caton): Right horn in section, to show bony core.

The more important of these dates are unfortunately misprinted in Judge Caton's great work on the *Antelope and Deer of America*, p. 26, where "1828" instead of 1858 is given as the date of Dr. Canfield's communication; and "1855" instead of 1865 as that of Mr. Bartlett's. Judge Caton's paper in the *American Naturalist*, 1876, p. 199, prints the Canfield date as "1848" instead of 1858.

The establishment of the deciduous nature of the horns reopened, of course, the whole question of the zoological affinities of the animal. It was soon decided that no recognized family of ruminants could properly contain so remarkable a form. The family *Antilocapridæ* was consequently instituted for its accommodation, and is now universally recognized by naturalists.

CHARACTERS AND POSITION OF ANTILOCAPRIDÆ.—The family belongs to the series of typical unguligrade *Pecora*, or ruminants proper, having a quadripartite stomach with well-developed psalterium and polycotyledonary placentation. This series contains the *Giraffidæ*, *Saigidæ*, *Bovidæ*, and *Cervidæ*, besides the *Antilocapridæ*, which come between the two last named. The inter-relationships of the three are expressed in the following manner by Gill ("Arrang. Fam. Mamm.," Smiths. *Misc. Coll.*, No. 230, 1872, p. 72):

i. Skull with the auditory bulla produced downward, especially towards the inside, and applied behind to the paroccipital process. Styloid process deflected more or less forward and enclosed in an oblique fold on the outer surface of the auditory bulla. Palatine axis declivous from the occipito-sphenoid axis.

a. Horns persistent (common to both sexes), and developed as sheaths of true "horn" on osseous cores originating from the frontal bones. Styloid process partially enclosed in a more or less open canal. *Bovidæ.*

b. Horns deciduous, peculiar to the rutting season (in both sexes), developed as pseudo-corneous sheaths with agglutinated hairs on osseous cores originating from the frontal bones. Styloid process completely enclosed in a canal by the lateral extension of the base of the bony meatus auditorius. *Antilocapridæ.*

ii. Skull with the auditory bulla little produced downward, and applied only to the inner surface of the paroccipital process. Styloid process directed downward, interposed between the bulla and paroccipital process, and not enclosed in an oblique fold of the auditory bulla. Palatine axis nearly parallel with the occipito-sphenoid axis.

c. Horns (when present) deciduous, developed as solid "antlers," without separate bony core (with few exceptions confined to the male sex) .... *Cervidæ.*

It may be added that with the exception of *Saiga*, "antelopes" are a subdivision of the great family *Bovidæ*, coming between the cattle and the sheep and goats. The *Cervidæ* include all the "deer" excepting the *Tragulidæ*. Not only the position and relations of the styloid process, but many other cranial characters, too numerous to be detailed here, distinguish *Antilocapra* from its allies.

HORNS.—Though the horns of *Antilocapra* are among the secondary sexual characters of the animal, and in some sense "peculiar to the rutting season," they are nevertheless worn the greater part of the year, being rapidly reproduced when shed. In general, they may be likened to the hairy, skin-covered frontal knobs of the camelopard, rather than to the hard horns of cattle, sheep, and goats. They are entirely unlike the solid antlers of deers, except in being deciduous; and the shedding is accomplished by a process much modified from that accomplished by the *Cervidæ*. The basis or core of the horn is a solid, immovable bone, a process of the frontal, attaining in the male a length of five or six inches; it is an inch or two broad, but greatly compressed; its direction differs in different individuals, but is usually upward, outward, and a little forward It rises directly over the orbit of the eye, and commonly extends as far at least as, if not beyond, the position of the "prong" or "snag" upon the horny sheath. It is, however, simply a straight bony process, having no enlargement to correspond to the outward prong. It is invested with modified integument, the growth and development of which into partly horny substance form the outward sheath or horn proper. When an old horn falls, the bony core is found to be already invested with new skin, bearing delicate "velvety" hair; thus ready to make the new horn. The sheath consists of agglutinated hairs, becoming more and more hard and horny toward the tip, the whole structure being simply thickened and hardened integument, bearing less and less hair toward the end. When new and rapidly growing, the horns are highly vascular. A freshly-killed antelope, circumcised about the root of the horn, bleeds profusely from the large vessels divided, and the substance is there thick and fleshy—quite as much so as the hide is elsewhere. Such fresh, thick horns adhere closely to the core, and are only withdrawn with some little force after being severed to the bone around the base. As the season advances the horn grows less vascular, much thinner and harder, and at length is a mere shell, which loosens and drops. The shell is thinnest around the base, and there, when the separation commences, the edge of the circumference is ragged, and the sheath may be split up or torn for some distance before it is completely detached. The process consists essentially in the pushing off of the old horn by the new one growing under and inside it.

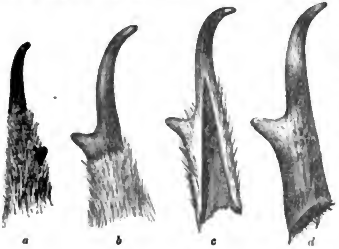


FIG. 2.—*a, b, c, d*, horns of prong-buck in various stages of growth; *c*, mature horn in section, to show bony core (from Hays).

In the male the horns attain a length of from six or eight inches to a foot or more. They usually stand nearly erect with reference to the lengthwise axis of the head, but flare outward from each other. The basal part or main shaft is much compressed, like the subjacent core, and very rough, being studded irregularly with little knobs and ridges. At the summit of this flat shaft the prong projects; then the rest of the horn, become more thoroughly corneous and more cylindric, tapers to a point with more or less curvature. I can only advert to the endless variability of the horns in precise shape—variations which have caused the establishment of nominal species. This is to some extent dependent upon the particular period in the growth of the horn; but there is a wide range of variation in perfectly mature horns after they cease to grow. The curvature is usually backward and inward, through scarcely or not a quadrant of a circle; but I have possessed horns in which the curvation brought the tip parallel with the main shaft, and not infrequently the curvation inward is so complete that the two horns, viewed from before, present a cordate figure. The position of the snag depends largely upon the growth of the shaft; it is at first situated quite near the base, and is gradually uplifted. The size and shape of the snag are very variable; very rarely there is a duplicate snag. It is usually triangular, the base applied to the shaft, and the point forward. It is about an inch in length, but very variable in size as well as in shape. The horn is black with yellowish tip.

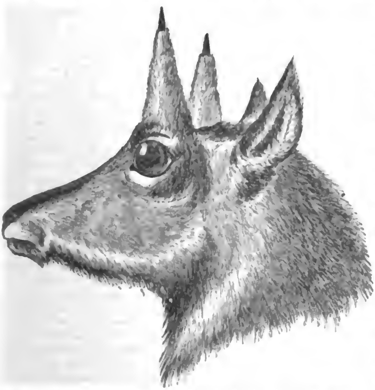


FIG. 3.—Young male prong-buck, with growing horns (from Hays).

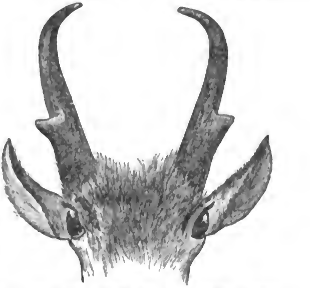


FIG. 4.—Adult male prong-buck, horns viewed in front.

In the female the bony horn-cores are much smaller. The whole outer horn is perfectly straight, and represents a thimble of horn-substance about an inch long supported upon a two-inch hairy base, without any snag. "When the male kid is born a protuberance may be felt where the horn is to grow. This grows with the kid, and by the time it is six months old the little horn breaks through the skin, presenting a sharp hard point. This horn perfects its growth from the first to the last of January, when it has attained a length of an inch or less, and is then cast off. The next horn is perfected and cast earlier, and so on till full maturity is attained, when the horn is thrown off in October, though in this strict uniformity must not be expected" (*Caton*). When the old horn drops the new one has already made considerable growth. In the case of an animal ranging so widely, from British America into Mexico, there must be great difference in the period of the rut, and as the growth of the horns depends entirely upon the sexual system, no precise period can be assigned, more than that the full maturity and effectiveness of the horns as weapons of offence and defence are coincident with the rutting season. In the mountains of Colorado, where I have chiefly hunted the antelope, bucks killed in September had the horns perfectly developed, closely adherent, and still bleeding when cut about the base. The rut ensued late in that month; I presume that the horns then perfected would be shed when that season was over, late in the fall, and then the new ones would grow until the rutting-time in the following year. Bucks killed in Arizona in June had smaller horns, with nothing but soft, velvety membrane upon the core when the sheath was removed. In the Milk River region, adjoining the British possessions, the rut is earlier than in the south, and with it the change of the horns.

A correspondent, Lieut. C. Gardener, U. S. A., writing a private note from Camp Supply, Indian Territory, assigns a later period than that given by Judge Caton (October). He says: "I am satisfied the antelope sheds its horns in this latitude about the latter part of December or first of January. In two separate cases this winter my dogs caught an antelope that was about to shed, and from my own observations I have found that in November and December buck antelopes have large horns, excepting the yearlings, the prong of whose horn is slightly developed—that about the end of December the shell begins to loosen."

A writer in the Chicago *Field* of Dec. 1, 1877, says: "To the best of my knowledge, about Pueblo, Col., they begin to shed about the middle of December, and from that time to the middle of January you can see some with both horns off, others with one horn, and still others with both horns on; but after the 15th of January you will not find a buck with horns."

CUTANEOUS GLANDS.—Other characters of the *Antilocapridæ* were long unknown or misapprehended, and among them the remarkable system of cutaneous sebaceous glands. Possessing neither the larmiers (tear-bags) nor the metatarsal glands of the *Cervidæ*, the prong-buck has nevertheless a very extensive set of odoriferous glands, which during the rut particularly, when excited to the highest functional activity, give out a strong hircine odor. There are no fewer than eleven of these glands—one between the toes of each foot (4); one at the black patch beneath each ear (6); one over each ischium (8); one at each hock (10); and one on the croup in the middle line, just where the white disc of the buttocks joins the tawny hair (11); the latter reminding one of the dorsal gland in *Dicotyles* (peccary). Whether or not the nature of the secretion is the same in all of these is not ascertained. The activity of the pair at the angle of the jaws below the ears, and of those over the ischia, is greatest during the rut. At that season, when the neck of the buck swells visibly, the black patch behind the jaw, directly over the gland, may be observed to be matted or pasted down with the copious saffron-colored waxy secretion. The odor is strongest from the ischiatic glands, and extremely pungent; in fact, I have sometimes found the venison unpleasant from its muskiness during the rutting season. Glands are present in both sexes, and the odor is always perceptible. Whether from these special glands or not is uncertain, a kind of oily secretion may be noticed over much of the animal about the roots of the hairs.

PELAGE.—The coat of the prong-buck is coarse, stiff, harsh, and extremely brittle—almost like fine-spun glass, though the hairs have much pithy substance surrounding the central cavity, and little or no gloss. They are so unsubstantial and inelastic as to break down and not recover when sharply bent at an angle. From these characters they are totally devoid of any felting quality, and not even fit for the stuffing of pillows. Though thus worthless, they are not seldom used with fraudulent intent to mix with the proper filling of hair mattresses. There is a slight under-coat, but it is short and scanty in comparison with that of allied ruminants. The whole pelage, on the living animal, lies smooth, without any flowing tufts, though there is a slight mane, the hairs of which are some three or four inches long. The color in general is tawny or yellowish-brown, with a large disc on the buttocks, a crescent and triangle on the foreneck, the upper lip, chin, most of ear, spot behind ear, insides of the limbs, and whole under parts, white; the forehead, top and sides of muzzle, spot over the neck-gland, hoofs and most of the horns, black or blackish. The kids are like the adults, showing nothing of the white spots and streaks so characteristic of the fawns of the *Cervidæ*.

OTHER CHARACTERS.—The hoofs are small, neat, and trim. There is no trace of false hoofs. The tail is extremely short, and included in the white area of the buttocks. The limbs are slender and clean-cut. The general form is that of a deer, but, contrary to the general impression, the build is stouter and more compact, instead of more slender and graceful, the neck particularly being relatively shorter and thicker. The size is less than that of the average Virginia deer (*Cervus Virginianus*). The ears are erect and pointed. A remarkable feature of the prong-buck is the extremely large eye, full of expression, black, soft, and liquid—in all these respects rivalling that of the gazelle. It is said to exceed in absolute size that of the horse or ox, and to be nearly as large as that of the elephant. It is always completely black or dark brown, and its situation, directly beneath the base of the horn, adds to the singularity of expression.

Though the pelage is worthless, the hide itself furnishes as excellent and valuable "buckskin" as that of any of the *Cervidæ*. The venison is usually of excellent quality, resembling mutton in the readiness with which the fat flakes on cooling, but darker, dryer, finer-grained, and of different flavor.

STATURE.—A fine buck, taken by myself in Northern Montana, Aug. 10, 1876, and carefully measured in the flesh, offered the following dimensions (inches and decimals): Nose to eye, 8·50; to ear, 12; to hind head, 12·75; to root of tail, 55; tail (vertebræ), 4; with hairs, 6; wrist to end of hoof, 14; whole fore leg, 24·50; fore hoof, 3; heel to end of hoof, 16·75; whole hind leg, 30·25; hind hoof, 2·50; height of ear, 5·50. Another gave—Femur, 9; tibia, 11; metatarsus, 12·25; humerus, 5·25; ulna and radius, 10·50. The skull and horns of the first gave—Horn over all, measured around its convexity, 14; chord from base to tip, 9·50; base to end of snag, 6; width of base, 2·50; distance between horns at base, 3; distance between their tips, only 1·50 (exceptional; often reaching 6 or 8 inches); length along base of skull, 12; muzzle to end of bony palate, 6·90; diameter of orbit of eye, 1·75; greatest width of palate, 2·25; width of skull across orbits, 5; under jaw, apex of coronoid to base of incisors, 10·75; condyle to ditto, 9·75; angle of jaw to ditto, 9; length of the upper molar series, 3; of under ditto, 2·75. These are fair dimensions, as shown by many others I have made in Montana, Colorado, and Arizona. Southern specimens, however, average smaller than northern ones. The doe is smaller than the buck. The standing height at the withers is about or rather less than three feet; at the croup, about or rather more than three feet; the difference, usually two or three inches.

The scrotum of the male is external, but little pendent, and not ordinarily conspicuous. The penial sheath extends about four inches along the abdomen. The mammæ are four; the udder inguinal, as usual. The gall-bladder is present.

GEOGRAPHICAL DISTRIBUTION.—As already stated, the prong-buck is peculiar to Western North America. Its range is still extensive, though sensibly contracted by the settlement of the country, especially on the Pacific side. It inhabits unwooded country, whether perfectly open and flat or much broken, from at least 54° N. to the tropic of Cancer. In Dakota the easternmost point at which I have observed it is near Turtle Mountain, at 49°, along the course of the Mouse or Souris River; it is more abundant in that latitude westward, in the region of the Missouri water-shed (the Milk River region), being abundant about the Sweet Grass Hills or Three Buttes of Montana and other outlying hills of the Rocky Mountains. I have nowhere else found it so abundant as it is, or was a few years ago, about the head-waters of the Platte, in North Park, Col., and the adjacent Laramie Plains. Many thousands breed in the first-named locality. In Arizona it is still tolerably common, especially in northern portions of that Territory, adjoining the Grand Cañon of the Colorado, on the south side. It is said to have formerly abounded in open parts of California and Oregon, whence, however, it appears to have mostly withdrawn of late years. It is not, however, speedily banished from its favorite resorts with the settlement of the country. Its wariness and fleetness enable it long to maintain a foothold, and its attachment to particular regions is notable. Unlike the buffalo, it does not appear to have ever ranged east of the Mississippi, and it seems scarcely to have reached that river, excepting in the upper portions of its course. Though eminently a creature of the "boundless prairie," and neither of high mountains nor of forest, it is very often found in broken and precipitous places, where it can with difficulty, if at all, be followed on horseback; and I have occasionally shot an antelope in a place which I could scarcely have reached on horseback. The same is true of the buffalo. Judge Caton has correctly stated the case in few words: "It seeks treeless plains, ravines, and rolling foot-hills, avoiding the high mountains and heavily-timbered regions, though at times it may be found in park-like countries where trees are sparse." The latter is especially true of the does when with young. In Colorado I have repeatedly noticed the predilection of the females, when accompanied by tender kids, for knolls and hillsides on the edge of cover into which they may retreat and hide on alarm.

Reproduction.—Unlike the deer, the prong-horn, as a rule, produces twins. This is during the spring and summer, the precise time varying much, chiefly according to latitude. In Southern California, according to Dr. Canfield, the antelopes are banded together —bucks, does, and yearlings—from September until the following March, when the does separate and seek safe places to drop their burdens, while the bucks wander at large in small parties or singly. After two or three months the does and their progeny are joined by the yearlings, and finally, by the end of summer, all are banded together again, to the number of hundreds or even thousands. In Northern Montana, however, I have picked up new-born kids in July; and again, in Colorado, during September, have found kids still following the dam, either off with her on the knolls and "look-outs" above mentioned, or, grown larger, in bands of considerable numbers of both sexes and all ages just making up before the rut. At this period the combats of the rival bucks are described as fierce and protracted; but I should doubt, if there were no perfectly reliable witness, whether the natural mildness of disposition of the creature is so far transformed even at this period, as is usual in the case of the *Cervidæ*. Probably no animal is more meek and gentle than the antelope, which I have never known to make the slightest show of resistance, much less of self-defence, even when disabled and about to be despatched with the knife. On the other hand, the salacity is extraordinary.

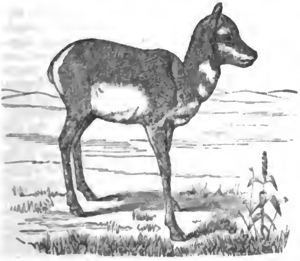


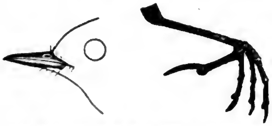
FIG. 5.—Kid prong-buck (from Caton).

General Traits, and the Chase.—It is difficult to exaggerate either the timidity or the curiosity of this animal, or its fleet-footedness. Living habitually in open country, and nearly always on the alert, it would ordinarily be difficult to come up with and secure were it not for the inquisitiveness which so frequently proves fatal when the concealed hunter decoys the curious creature within rifle-range by the display of some fluttering object. I have never practised this method, having chiefly hunted the antelope in broken country, where the device was superfluous; but it is described in most writings upon the subject, and doubtless with much foundation in truth. But the fact is, that almost any unwonted appearance will cause the creature to stand and gaze for a few seconds before it takes to its heels. Thus, travelling in broken country, I have often had antelopes stop and stand in full view of myself and horses and wagon, and do this repeatedly within easy rifle-range. As a rule, an antelope which has made off at the first alarm will stop on the first rising ground and turn half around for a last look at the object which has excited its fears, be that what it may. But its behavior at different times is so variable that it is hard to predict what will be done. I have seen bands scouring the plains in alarm as far as the eye could reach, the long train of round white objects (the disc on the rump) undulating with a singular appearance, while the bodies of the creatures were scarcely discernible; and again have myself been gravely and intently inspected by some beautiful creature standing within a few yards of me whilst I dismounted to deliver a fatal shot. The gait is indescribably free and easy. At full speed the antelope is probably the most fleet of all our game, and the bounds it makes on level ground or across depressions are astonishing. At the same time, it does not appear to have learned how to leap high to avoid an obstacle. In parked country I have seen a terrified band floundering in a little patch of windfall through which a horse would have proceeded with greater ease if not with equal celerity. Nor has the swift-footed creature much bottom. Its astonishing bursts of speed cannot be long sustained, and advantage is constantly taken of this fact in coursing the antelope, a fair pack of hounds being able to come up with it if the advantage at the start be not too greatly in favor of the game. It is, however, tedious and uncertain, and by far the greater number of antelopes which are destroyed are reached by stalking or decoying, or both of these methods together. I have thus far referred to methods employed by white hunters. Indians have a variety of ways of accomplishing its destruction, only one of which I have personally witnessed. In Arizona the Indian antelope-hunter provides himself with a head-dress made of the skin of the head, with the horns and ears, of an antelope, stretched upon a light wooden framework. His shoulders are covered with the hide of the animal, or, in default of this, with a piece of cloth daubed with ochre. Thus disguised, and creeping or stooping, and imitating with marvellous accuracy the motions of the antelope, the hunter has little difficulty in approaching the band as closely as he desires; and this is very short range, for an Indian is economical of ammunition, wasting little on poor or chance shots.

The antelope is readily domesticated, but thus far there has been some obstacle to its breeding under these artificial conditions. It has indeed occurred, but only very exceptionally. Dr. Canfield and Judge Caton are the leading authorities on this score. Says the latter: "The prong-buck is very easily tamed, and soon loses all fear of man, seeks his society, and enjoys his company. When taken young and brought up by hand, they become at once attached to the one who feeds them. I raised one thus, which was taken charge of by a little girl, and nothing delighted it so much as to have a play and a romp with her; and in watching them together it was easy to persuade one's self that the little pet showed not only observation and intelligence, but even reflection. He assumed he had as much right in the kitchen as any of the domestics; and if he found the doors open he enjoyed a visit to the parlor, and especially a siesta on the lounge in the library."

With reference to the faculty of weeping in affliction I will quote once more from Judge Caton, and conclude a protracted article: "I first observed this in a specimen which had been taken wild when adult, and still retained all his natural fear of man. I had placed him in a close cage in the evening, intending to familiarize him with my presence, and to divest him of his fears when he saw me by convincing him that I would not hurt him. When I approached him next morning he seemed struck with terror, and made frantic efforts to break out, which he soon found was impossible. His great black eye glistened in affright. I spoke softly and kindly, while he stood trembling, as I introduced my hand and placed it on his shoulder. Despair now seemed to possess him; he dropped on to his knees, bowed his head to the ground, and burst into a copious flood of tears, which coursed down his cheeks and wet the floor." (E. C.)

ANTHINÆ, a sub-family of birds of the family *Motacillidæ*, represented chiefly by the genus *Anthus*, which includes numerous species of pipits or titlarks, as they are variously called—*A. pratensis*, *A. arboreus*, etc., of Europe, and *A. ludovicianus* of North America.



Bill and foot of *Anthus ludovicianus* (natural size).

They are small, simply-colored, terrestrial, insectivorous birds, usually found in flocks, nesting on the ground and laying dark-colored eggs. The so-called Missouri skylark, *Neocorys Spraguii*, rival of the European skylark as a songster, is one of the *Anthinæ*. (E. C.)

ANTHONY OF PADUA, Saint (1195–1231), was born at Lisbon, Portugal, Aug. 15, 1195. He was the son of Martin Bulhan, a distinguished general in the Portuguese army, and was originally named Hernandez. When he reached the age of ten his education was entrusted by his pious parents to the priests of the cathedral of Lisbon. At fifteen he became a novice of the Augustinian order in the monastery of St. Vincent, outside the city walls, but finding his duties here frequently interrupted by visits of his relations, he obtained permission to go to the convent of the Holy Cross at Coimbra. In this place he spent eight years, applying himself with diligence to the study of the Holy Scriptures and the Fathers. He had already been ordained priest when a singular event changed the current of his life. In the spring of 1220 the relics of five Franciscan friars who had gone as missionaries to Morocco, and there suffered martyrdom, were, by the order of Dom Pedro, infante of Portugal, brought in solemn funeral procession through the kingdom to Coimbra, and there deposited in the cathedral. The soul of the young priest was inflamed with an ardent desire to follow in the footsteps of the martyrs. Though his brethren tried to hinder him, he obtained permission from his superior to enter the convent of the Minor Friars at Olivares, near Coimbra. At this time he assumed the name of Anthony, from the hermit saint to whom their chapel was dedicated. His desire to become a missionary to the Moors was soon gratified, for in December, before his year of probation had expired, he received the order to proceed to Africa. But scarcely had he landed there when he was seized with a fever, and after four months' illness was compelled to abandon the work. Embarking in a vessel to return to Spain, he was driven by a severe storm to the coast of Sicily. He landed, and made his way to Messina, where the Franciscans had a convent. Wasted with sickness and the perils through which he had passed, he yet was cheered with the hope of seeing the founder of his order at the chapter-general to be held on the approaching Easter at Assisi. Thither he travelled on foot, and among the assembled brethren the sickly and reserved Portuguese was neglected even by St. Francis. No work was assigned him till, at the close of the chapter, Gratian, the provincial of Romagna, learning that he was a priest, requested him to go to a convent on Monte Paolo, near Forli, where six lay brothers resided. For nine months Anthony lived in obscurity a penitential life, till, at a conference with some Dominicans at Forli, he was unexpectedly called by the guardian to preach. When his reluctance was overcome his hearers were quickly astonished at his eloquence, learning, and unction. The provincial, who was present, forthwith appointed him to preach throughout Romagna, and St. Francis, being informed of the providential discovery of his gifts, gave Anthony permission to exercise them throughout Italy. In his labors as an itinerant preacher the saint not only called evil-doers to repentance, but was obliged to refute the newly-revived errors of the Manichæans. Nature and grace had fitted him for his calling, and he was himself an exemplar of the truths he proclaimed. In many places thousands flocked to hear him, so that he often preached in the open air. Yet in others he was grieved at the carelessness of multitudes, and there is a tradition that when the people of Rimini neglected his preaching he called upon the fish to listen, who forthwith gathered near the shore and seemed to applaud his words. Miracles of a different kind are recorded as accompanying his labors, and after a time there was seen a genuine revival of religion, together with a reformation of conduct, in Romagna and other districts of Italy. Towards the end of 1222, St. Francis directed him to retire to Vercelli and study mystical theology under Abbot Thomas of the school of Victorinus of Paris. After five months spent there, he was made lecturer on theology at Bologna, being the first teacher in the Franciscan order. In 1224 he was appointed to similar duty at Montpellier, France, where he composed his *Sermons on the Psalms*. He is found next at Toulouse, engaged in controversy with the Albigenses, then at Puy as guardian of a convent, and at Limoges as *custos* for Southern France. Altogether, he spent in France three years of abundant labor. Meanwhile, the founder of the order died, Oct. 4, 1226, and it was necessary to choose a successor. Anthony as an authorized elector attended the chapter held at Assisi at Easter, 1227, when John Parenti was elected head of the order. Anthony, now thirty-two years of age, was made provincial of Upper Italy. He turned his journey of visitation into preaching-tours, and in November, 1227, for the first time entered Padua, which henceforth became the centre of his operations. In 1230, as provincial, he attended the chapter-general held at Assisi when the body of St. Francis was transferred to the splendid basilica built in his honor. At this meeting there was a diversity of opinion as to the extent of the obligation of poverty in the rule of the order, and the assembled fathers agreed to request the pope to decide the matter. Anthony was appointed to present the case, and was thus led to spend four months in Rome, during which time he frequently preached before the pope and the cardinals. The explication of the rule requested by Anthony on behalf of the whole order was published Oct. 28, 1230. Errors concerning the mission of St. Anthony to Rome arose at an early period, the Fratricelli, or Spiritual party, asserting that he and others in favor of a strict observance of the rule of St. Francis had gone to Rome and procured from the pope the deposition of Elias of Cortona from the headship of the order on the ground of his violations of the rule.

Now, Elias did not become head of the order till after the death of Anthony; nevertheless, these errors are incorporated in many histories, though the facts have been clearly elucidated as given above. In November, 1230, Anthony, with the pope's approval, resigned his provincialship, that he might devote himself to the work of missions and instruction. In this he spent his few remaining months, and ended his laborious life at Arcella, a village adjoining Padua, June 13, 1231. According to his request, though not without opposition from the villagers, his body was removed five days later to the church of Sta. Maria Maggiore in Padua. He was canonized by Pope Gregory IX., May 30, 1232. More than thirty years later the splendid church at Padua bearing his name was completed, and his remains were transferred to its altar April 7, 1263. It is said that when the coffin was opened his tongue was found perfect, though the rest of the body had decayed. He is the patron saint of Padua, and is venerated especially in Portugal and Italy. His *Sermones Quadrigesimales et de Tempore* were first printed at Paris in 1521; a more complete collection of his works, together with those of St. Francis, was edited by De la Haye at Paris, 1641. It includes, besides the sermons, a mystical exposition of the Scriptures and *Concordantiæ morales sacrorum Bibliorum*, the first analytical concordance of the Bible. His *Sermones in Psalmos*, 278 in number, were published at Bologna in 1757, with a biography by Polentonus and notes by A. M. Azzoguidi. His *Life* has since been written in Italian by E. Azevedo (2d ed., Bologna, 1790; 4th ed., Venice, 1818). A popular *Life*, by Dircks, has been translated from the French and published in New York, 1866. Its statements, however, are not always exact. The latest edition of his works is by Horoy in *Medii ævi Bibliotheca Patristica* (Paris, 1880). St. Anthony's sermons, as they are now presented, are mere sketches, abounding in allegorical interpretations of Scripture, and do not explain his wonderful influence as a popular preacher.

ANTHONY, **Susan Brownell**, an American social reformer, was born at South Adams, Mass., Feb. 15, 1820. Her father, Daniel, was a cotton-manufacturer and a member of the Society of Friends. In 1826 he removed to Washington co., N. Y., and Susan was educated at first in a small school held in his house, and afterwards at a school in Philadelphia. At the age of seventeen she began to teach, and continued to be so employed in the State of New York till 1852. During the temperance agitation about 1846 her interest in this cause led her to address some women's meetings, though the popular prejudice against women taking part in public work was then very strong. In 1848 a convention was held at Seneca Falls, N. Y., by Mrs. E. C. Stanton and a few others, to call public attention to the injustice of laws affecting women and to demand for them equal rights with men. Miss Anthony became interested in the movement, and was soon one of the most active workers in it. She delivered lectures on social topics wherever she had opportunity, and organized many temperance societies. In 1851 she called a State convention in Albany to urge upon the public the question of women's rights. Before long she succeeded in securing for women admission to educational and temperance conventions on equal terms with men. Since 1852 she has devoted herself entirely to seeking to obtain for women equality with men in regard to education, property, and the elective franchise. During the anti-slavery movement she was a zealous worker in the cause of freedom, and during the War of the Rebellion she lectured on the questions of the day in the principal Northern cities. She took part in forming the Loyal Women's League, and urged upon the President and Congress the duty of universal emancipation. When the great social changes produced by the war and the abolition of slavery rendered amendments of the national and State constitutions necessary, the advocates of women's rights took advantage of this fact to urge the recognition of their ideas. In 1867, in Kansas, two amendments to the State constitution were proposed—one giving the elective franchise to negroes, and the other to women. Many leaders of the Republican party wished the former adopted and the latter deferred. An exciting canvass ensued when the question was submitted to the people, and Miss Anthony and others were summoned from the East to plead the cause of woman suffrage. Both measures were defeated, the amendment with regard to women receiving 9070 votes, and that with regard to negroes 10,843. On returning to New York, Miss Anthony became one of the editors of a weekly paper called *The Revolution*, in which she continued to advocate woman's social and political equality with man. In July, 1868, the Woman-Suffrage Association appointed her a delegate to the Democratic national convention, and she wrote a letter which was read before the convention, but had no practical effect. In 1869 she attended and addressed the first national woman-suffrage convention held in Washington. In 1872 the Republican national convention adopted a resolution that the demand of women "for additional rights should be treated with respectful consideration." Miss Anthony having been registered as a citizen in Rochester, N. Y., voted at the national election in November. For this as a violation of law she was arrested on Thanksgiving Day, and after some delay held in $1000 bail. Her trial took place before the United States district court at Rochester, June 18, 1873, and though she was ably defended by Hon. H. R. Selden, Judge Ward Hunt directed the jury to bring in a verdict of "guilty," refused a new trial, and sentenced her to pay a fine of $100 and costs. Miss Anthony has since continued to labor in behalf of woman's rights, urging upon the people of the United States the adoption of a sixteenth amendment to the national Constitution, to establish woman suffrage. She has also done much to improve the condition of the working-women of New York by obtaining for them just remuneration for their labor. She is an earnest and fluent speaker, rarely rising to eloquence; she has untiring energy, inexhaustible good-humor, and is quick to seize opportunities. In conjunction with Mrs. E. C. Stanton and Mrs. M. J. Gage, she has edited a *History of Woman Suffrage*, of which two bulky volumes have appeared.

ANTHRACENE (formula, $C_{14}H_{10}$), a hydrocarbon found in coal-tar, and serving as the basis of the manufacture of artificial alizarine, one of the most important of recent dye-colors. Anthracene was discovered by Dumas in 1831, but attracted relatively little attention until Graebe and Liebermann in 1868 showed that alizarine, the coloring-matter of the madder-root, was a derivative of it and could be made artificially from it. (See Artificial Alizarine, p. 179.) Anthracene is contained in that portion of the coal-tar which distils at 320° C. to 360° C., and which forms a semi-solid greenish oil formerly used as a lubricant under the name of "green grease." This greenish oil contains about 20 per cent. of anthracene, while the coal-tar contains only from 0·5 to 2 per cent., according to the degree to which the original distillation had been carried. The extraction of pure anthracene from this crude material has also been described under Alizarine (p. 179). In the year 1879 there were produced in Germany 125,000 kilograms, and in England, France, and other countries 825,000 kilograms, of anthracene. It has also been obtained synthetically by a variety of processes, such as the formation from benzyl-chloride, from benzyl-toluol, and from phthalic acid, and is formed in general by the condensation at high temperatures of hydrocarbons less rich in carbon. When pure it forms colorless scales, fluorescing blue; is difficultly soluble in alcohol and ether, but readily dissolves in hot benzol. It fuses at 213° C., and distils at a temperature rising above 360° C.

(S. P. S.)

ANTIDOTES. See Poisons.

ANTI-FEDERAL PARTY. Before the American Revolution the British North American colonies were generally recognized as independent of one another. Indeed, the home government steadily resisted any attempt at union among them as ominous of a more entire independence. In some cases attempts were made to unite two or more colonies under one government, but colonial boundaries had in general fallen in so closely with natural boundaries that these attempts were failures. Thus each colony grew up with most of the requisites for separate life, with its own legislature and judiciary, and with a common executive, the king, who retained, as in Great Britain, the great prerogatives of sending and receiving ambassadors, making treaties, war, peace, etc., but was represented in the colonies by viceroys or governors. At the outbreak of the Revolution the States acted as auxiliaries to the Continental Congress in the struggle, but in many cases they at first assumed to act as principals. Most of them expelled their governors, some of them began hostilities, and one, Virginia, even declared her independence without any reference to the other colonies or to Congress. By such steps as these there had been developed a strong class of State politicians, who controlled the State legislatures and aimed to subordinate the central government also. Until 1781 the Congress was altogether revolutionary, without defined limits to its powers, and dependent on popular acquiescence for their execution. Its delegates were appointed by the legislatures and recalled by them at pleasure; and, as any written constitution was to be approved by the appointing bodies, the delegates naturally were compelled to frame it so as to suit the controlling elements of the legislatures. The result was the Articles of Confederation, which were proposed by Congress Nov. 15, 1777, but did not go into force until ratified by the thirteenth State, Maryland, March 1, 1781. Under this system the central government was practically impotent. It had no power to control commerce, enforce obedience to treaties, raise troops, or levy taxes: in all these respects it could only recommend action to the legislatures, and every year the legislatures paid less attention to the recommendations of Congress. "Requisitions" on them for revenue became a farce. Taxes for the payment of interest on the public debt and for the running expenses of the government were either not levied or not paid; treaties were openly set at naught; ambitious States like New York began to impose restrictions on the commerce of their weaker neighbors; the gloom of general bankruptcy, domestic insurrection, and Indian war was deepened by the apprehension of a foreign war with Spain or Great Britain; and through it all the United States lay like a loosely-bound raft on the water, "a nation without a national government."

But during this period a class of "Continental" (national) politicians was developing, who were determined to restore to the States the national government which they had lost by the Revolution and had not regained by the Confederation. So long as these took no distinctive name there was but one party in the Union, the "American Whigs," who had carried the Revolution through. As soon as the new thinkers took the name of Federalists (see FEDERAL PARTY) the conservatives accepted the name of Anti-Federalists. They accepted it very unwillingly, claiming that they were the real "Federalists," since they wished to retain the federal alliance between the thirteen separate States, while their opponents were "nationalists." But popular common sense was quick to see that the essential basis of party division was now the proposed introduction of the new Federal government, and that those who opposed this were properly Anti-Federalists. When the Federal Convention of 1787 adjourned and offered the Constitution to the acceptance of three-fourths of the States, the Anti-Federalists took the field against it. Had they agreed in ratifying it "on condition" of its amendment by a second convention, their success in seriously altering the Constitution could hardly have been prevented. They preferred to oppose ratification absolutely, and were defeated. The compromises by which the Senate had been introduced into the scheme of government, and had been made the depository of the power of confirming appointments and treaties and a co-ordinate branch of the legislative power, placated most of the small States. In seven of the States, Connecticut, New Jersey, Pennsylvania, Delaware, Maryland, South Carolina, and Georgia, whose territory lay wholly on the coast or whose policy was controlled by their commercial element or by their claims to Western territory, the Anti-Federalists had little or no standing, and ratification was unanimous or nearly so. The remaining six States, for various reasons, were Anti-Federalist strongholds; but as the Constitution was to go into effect upon its ratification by nine States, it was necessary for the Anti-Federalists to hold at least five of them; and this they failed to do. Only two States, North Carolina and Rhode Island, rejected the Constitution. North Carolina's action was the result of her extent westward, and the consequent superiority in her convention of the backwoods element, averse to strong government; and the same result would have occurred for the same reason in Pennsylvania but for the action of the State legislature in giving so short a time for the election of the State convention as to cut off the western part of the State from participation in it. Rhode Island lay wholly on the coast, and was considerably engaged in commerce, but her agricultural element was numerically superior. was fanatically devoted to the State's paper-money, which would be illegal under the Constitution, and refused to call a convention. New Hampshire's action was largely controlled by that of Massachusetts. In the remaining three States, New York, Massachusetts, and Virginia, the Anti-Federalists were only beaten after a struggle whose severity is shown by the votes in the table below. In all of them the battle was essentially one of the agricultural interest against the other interests which desired ratification. In New York the State politicians, headed by Governor Clinton, wished to retain the State's power to tax foreign commerce, and the [State] custom-house at New York City was the focus of Anti-Federalist intrigue. When the State convention met it had an Anti-Federalist majority, and a vote at that time would have resulted in a rejection of the Constitution. But the majority gradually melted away under the arguments of Hamilton, Jay, and Livingston and the rapid ratifications of other States. At last a conditional ratification was offered, reserving to New York a power to secede if certain amendments were not acted upon within six years. This was rejected by the Federalists as worse than no ratification. A Federalist motion to substitute "in full confidence" for "on condition" was then carried by a vote of 31 to 29; and as this was the test vote, it is often given as the vote on ratification, but not correctly. The State politicians of Virginia and Massachusetts, particularly the former, had gone to the Federal Convention bent on securing a strong Federal government, with a single house of Congress controlled by the large States, and a President elected by Congress. The Senate compromise had converted them into Anti-Federalists, and made them the leaders of the agricultural opposition in their States. In Massachusetts they had but two leaders of marked ability, Elbridge Gerry and Samuel Adams, and against them were all the other State leaders, Bowdoin, Fisher Ames, Parsons, Rufus King, Sedgwick, Dana, Gore, Strong, Sumner, and Cabot. In Virginia the weight of talent was more evenly balanced, and the debates are the most important of the State conventions. The Federalists were led by Madison, Edmund Randolph, John Marshall, and Pendleton; and of these Madison did by far the heaviest work. The Anti-Federalist leaders were Patrick Henry, Monroe, Theodoric Bland, William Grayson, and George Mason. In both States the same result was reached, though it was called "the Massachusetts plan" at the time. The Constitution was unconditionally ratified, but a strong recommendation of certain amendments was added.

Chronologically, the ratifications by the State conventions were as follows: Delaware, Dec. 7, 1787, unanimously; Pennsylvania, Dec. 12, 46 to 23; New Jersey, Dec. 18, unanimously; Georgia, Jan. 2, 1788, unanimously; Connecticut, Jan. 9, 128 to 40; Massachusetts, Feb. 7, 187 to 168; Maryland, April 28, 63 to 12; South Carolina, May 23, 149 to 73; New Hampshire (ninth State), June 21, 57 to 46; Virginia, June 26, 89 to 79; New York, July 26, 30 to 27 (on the final vote). North Carolina, Aug. 2, 1788, by 184 to 84 refused to ratify without a bill of rights and amendments, but a new convention, Nov. 22, 1789, ratified the Constitution by 193 to 75. In Rhode Island the legislature referred the Constitution to the town-meetings, where it was rejected, in March, 1788, by 2708 votes to 232, but it was finally ratified by a convention, May 29, 1790.

This great defeat ended the party existence of the "Anties," as the Federalists commonly called their opponents. In the first two Congresses under the Constitution they were hardly represented at all, and made little opposition to the measures of the dominant party. It was not until Hamilton's policy had divided the original supporters of the Constitution that State feeling made its appearance again; and, curiously but naturally enough, it now took the form of a party devoted to the support of the very Constitution which it formerly opposed, interpreting it now strictly and literally, and against the Federal Government (see DEMOCRATIC PARTY). But it is noteworthy that in the new alignment of parties a few of the former Anti-Federal leaders, particularly Patrick Henry of Virginia and Luther Martin of Virginia, became hearty Federalists. The general rule, however, was that the old Anti-Federal party became an integral part of the new Republican, or Democratic, party.

One of the most suggestive, though meagre, authorities for this whole period is 1 Von Holst's *United States*, 1–63; see also the general histories, 3 Hildreth's, 2 Pitkin's, 1 Schouler's, and 1 Tucker's *United States*; 9 Washington's *Writings*, particularly his letters of Aug. 1, 1786, to Jay, at page 187, and Oct. 31, 1786, to Henry Lee, at page 203; 4 Sparks's *Correspondence of the Revolution*, 153 (Jay's letter of Jan. 7, 1787, to Washington); 1 Curtis's and 1 Bancroft's *History of the Constitution*; 4 *Journals of Congress*, 614–618 (committee reports of Feb. 3, 7, and 15, 1786); Story's *Commentaries on the Constitution* (ed. of 1833), §§ 243–271; 5 Elliot's *Debates*, 109 (Madison's historical introduction to the debates); a pamphlet collection of *Recommendations of Congress to the State Legislatures*, published in 1787; *The Federalist*. Elliot's *Debates* is the standard authority for the proceedings of the Convention and the ratifications by the States; see also 2 Curtis's and 2 Bancroft's *History of the Constitution*; Jameson's *Constitutional Convention*. The State sovereignty view of the Confederation period is best seen in 1 A. H. Stephens's *War Between the States*, 82–116; "Centz's" *Republic of Republics*, 74–156. See also authorities under FEDERAL PARTY; DEMOCRATIC PARTY. (A. J.)

ANTILOCAPRIDÆ. See ANTELOPE, AMERICAN.

ANTI-MASONRY. Since 1830 the proportional power of the society of Freemasons in the United States has been very much diminished, partly by the increased compactness of population, and still more by an irruption of rival societies and the reduction of the whole to the common level of benevolent societies. But before 1830 the society's power was very much greater. In sparsely-settled regions membership in it formed a tie that was highly appreciated, and the private correspondence and autobiographies of public men of the time show that the mutual claims of "brother Masons" extended very far into politics. Few men succeeded in rising high in the public service unless their qualifications included membership in the society, and, whether correctly or mistakenly, able men who were not members of it were apt to attribute their defeats to the society's hostile influence. In this way there had been developed a silent dislike to Masonry which needed only an exciting cause to shape it into party form; and this was supplied by the abduction of William Morgan, of Batavia, Genesee co., N. Y., in 1826. He had announced for publication a book exposing the secrets of Masonry, and was at once arrested, nominally for debt. Released on this charge, Sept. 12, he was seized and conveyed in a close carriage to Niagara. Here all trace of him was lost, though bodies alleged to be his were occasionally found, and one of them was pronounced by the politicians of the day "a good-enough Morgan till after election."

In Western New York the whole responsibility for the abduction was thrown upon the society, and public opinion gave its verdict against it. Young men like William H. Seward, Millard Fillmore, and Thurlow Weed forced their way into politics as Anti-Masonic leaders, and the movement took consistent party shape. In the "infected district" of Western New York candidates of any party who refused to disavow all sympathy with Masonry were found to be hopelessly handicapped after 1827, and the feeling was evidently spreading to the rest of the State, and even into the neighboring States of Vermont, Massachusetts, Pennsylvania, and Ohio. In their State convention of August, 1828, the New York National Republicans were careful to nominate candidates who were not Freemasons; but the Anti-Masons, a few days after, nominated pronounced candidates of their own, and polled about 12 per cent. of the popular vote for them. In New York the National Republicans were an Adams party, and Adams attributed his defeat in 1828 in a considerable measure to Jackson's support by the Masonic society, of which he was a member. Thus, before 1830 the Anti-Masons of New York became the controlling opposition to the State Democratic party, and in 1831 the Anti-Masons of Adams's district elected him to Congress, where he remained for seventeen years.

But the reorganization of national parties in 1829–32 at once brought the New York Anti-Masons into deep water. Jackson had become the recognized head of the Democratic party, and Clay was developing a corresponding strength in the opposition. Both were Freemasons, and the Anti-Masons could not hope to gain or retain control of New York as a separate State party while the two national parties were headed by Freemasons. To force the hand of the opposition, the Anti-Masonic State convention in February, 1830, decided to call a national nominating convention; and this decision was confirmed by a national conference in the following September. The convention was held at Baltimore, Sept. 26–28, 1831, and nominated William Wirt of Maryland and Amos Ellmaker of Pennsylvania for President and Vice-President. The National Republicans, however, refused to follow suit, and nominated Clay, and Wirt and Ellmaker received the electoral votes of but one State, Vermont. This defeat really ended Anti-Masonry as a separate political force, for those of its adherents who had any other principles at stake perceived that they could hope for success only in the party which had formed behind Clay. Clay's own declarations, "that he had never acted, in public or private life, under any Masonic influence; that he had long ceased to be a member of any lodge; that he had voted for Adams, no Mason, against Jackson, a Mason," etc., were good reasons to many Anti-Masons to tolerate Clay's leadership, and after 1834 they subsided into the mass of heterogeneous elements which then took the name of the Whig party in national politics. But in New York, Pennsylvania, and Vermont they were for some years the controlling anti-Democratic organization, and in Massachusetts and Ohio they were at least strong local parties. In 1835, under the leadership of Thaddeus Stevens, they succeeded in electing a governor, Joseph Ritner, in Pennsylvania. Even in national politics, their influence as a part of the Whig party was greater than it had been while they aspired to a separate political existence. Their continued repugnance to Clay took the Presidential nomination from him and gave it to Harrison in 1835 and 1839, and his defeats at the polls in 1844 and at the Whig convention in 1848 were due in some measure to the old Anti-Masonic feeling in Western New York, Pennsylvania, and Ohio. But these latter effects were a lingering remnant, and can rather be guessed at than traced clearly. After 1840 the current of Anti-Masonry is lost, and its leaders are recognized only as Whigs. (See WHIG PARTY.)

The feeling which engendered Anti-Masonry has never wholly disappeared. In 1868 it gave rise to the "National Christian Association," which took the name of the "American party" in 1875, and has since held conventions and made nominations at each Presidential election. Its popular vote has not yet passed beyond the few thousands classed as "scattering." Its newspaper organ is the *Christian Cynosure*, published at Chicago, Ill.

See in general Creigh's *Masonry and Anti-Masonry;* Brown's *Anti-Masonic Excitement in 1826–29;* Ward's *Anti-Masonic Review, 1828–30;* Greene's *Broken Seal;* Stone's *Letters on Anti-Masonry;* W. H. Seward's *Works; Proceedings of the United States Anti-Masonic Convention;* Gasset's *Catalogue of Anti-Masonic Books in Public Libraries.* For Anti-Masonry in New York see 2 Hammond's *Political History of New York*, 369–403; in Pennsylvania, Harris's *Political Conflict in America*, 21–43. Clay's *Private Correspondence*, 289, 304, gives a very clear statement of the status of Anti-Masonry in 1831, and of Clay's personal feeling in regard to it. (A. J.)

ANTIOCH COLLEGE, an institution of learning at Yellow Springs, Greene co., Ohio, was founded by the Christian denomination, and was so named because "the disciples were called Christians first in Antioch" (Acts xi. 26). It was incorporated in 1852, and Horace Mann, LL.D., noted for his educational labors and reforms in Massachusetts, was made president. Some Unitarians in New England contributed to its endowment, wishing to establish in the West a college as free as possible from sectarianism. Dr. Mann entered upon his work of instruction while the buildings were unfinished and surrounded with the stumps of the trees which had been cut down to make room for the college. The number of applicants for admission was large, but of the first that presented themselves, only eight were found sufficiently advanced to enter a freshman class, and the rest were formed into a preparatory school. Here, amid difficulties and vexations of all kinds, Dr. Mann toiled earnestly, patiently, and perseveringly to introduce a spirit of culture and refinement. He insisted that good moral character should be an essential requirement in students, not less than intellectual attainments. Antioch College was probably the first institution in America that opened every facility for higher education to women equally with men. Throughout the six years of Dr. Mann's presidency financial troubles threatened the existence of the college, but his friends in the East helped the cause from time to time. After his death, in 1859, Rev. Thomas Hill, D. D., became the president, and remained here until he was elected president of Harvard College in 1862. Rev. George W. Hosmer, D. D., was the next president of Antioch College, holding his position for ten years, when he was succeeded by Prof. Edward Orton. In most of this time the attendance of students was good, about one-third of them being women. The buildings cost $150,000, and there is an endowment of $103,000. The college was closed in 1880, but was reopened in 1882, being now entirely under the control of the denomination by which it was founded. Rev. O. J. Wait, who has been interested in it since its foundation, is now president. There are 4 professors, 3 tutors, and 82 scholars.

ANTI-RENTERS. By the eleventh article of the surrender of the province of New York in 1664, "the Dutch here shall enjoy their own customs concerning inheritances;" "in pursuance of which," says Cadwallader Colden in 1732, "the inhabitants took out confirmations of their lands and tenements under the hand and seal of Col. Nichols, the first English governor under the duke of York, in which their title under the Dutch is recited." In the Dutch territory along the Hudson most of the soil had been granted to "patroons," who sold it in parcels to tenants. The tenants became owners in fee, with the power of alienation; but, instead of taking a principal sum in payment, the patroons reserved a perpetual fee-farm rent as a charge upon the freehold. This tenure was most common in the counties of Albany, Rensselaer, Delaware, Greene, and Columbia, covering about half the course of the Hudson River from Albany to New York City. The most prominent examples of these "manors" were Rensselaerswyck, a Dutch manor granted in 1630, and confirmed by James II., lying mainly in the two counties first named; and Livingston manor, in the county last named, first granted in 1686, extending from the Hudson to the Massachusetts line, and covering 160,240 acres; but these were only leading instances of the common rule of land-tenure.

Tenants were never satisfied fully with their tenure, but trouble only began openly when the original Dutch tenants began to give place to New Englanders. These endeavored to establish the authority of Massachusetts up to the Hudson River, and the consequent overthrow of the patroons' title; and for some years before and after 1750 there was a very considerable antagonism between the authorities of the two colonies, accompanied with bloodshed by tenants and inferior officers. After the Revolution the dissatisfaction of the tenants increased rapidly, and on Jan. 7, 1795, the Livingston tenants petitioned the legislature to examine the patroon's title, alleging that the preliminary patents of 1684–85 had been small, and that the boundaries had been fraudulently enlarged in the collective patent of July 22, 1686, so as to cover a far larger territory than the royal governor had intended to grant. With this outburst the feeling subsided again until Jan., 1839, when Stephen Van Rensselaer died. He had allowed many of the rents to fall into arrears, and the attempt of his successor to clear up accounts and revive ancient manorial rights which had fallen into abeyance united the tenants against him. The excitement spread to other manors, and the "Anti-renters" became an organized body. Their grievances were mainly sentimental. Rents were low, not rising over 2 per cent. on the value of farms, and were payable in kind or its equivalent in cash; the tenant was at liberty to sell his farm if he wished, paying the patroon nominally one-fourth, but really about one-thirtieth, of the purchase-money; even this condition was commuted, after 1832, by a single payment of $30; and the tenant could thus, by paying a principal sum, free his farm from all demands of the great patroons, though some of the smaller landowners were less moderate in their terms. The great difficulty was that to the minds of the tenants the payment of a perpetual rent had come to seem only a "badge of feudal servitude," and the idea of its commutation by the payment of a principal sum only a demand for the purchase of their own and their fathers' improvements. There were no such substantial allegations of wrong and injustice as in the Irish land-difficulties, and yet the process of resistance in both cases was curiously similar. The "Land League," "boycotting," the "no-rent agitation," every step of the Irish difficulties of 1880–82, had its prototype along the banks of the Hudson forty years before. The inhabitants of whole towns and counties were united under written Anti-rent associations, with their own courts of justice. Process for rent-debts was resisted by bands of men disguised as Indians. Persons who adhered to the patroons or remained neutral were regarded and treated as enemies of the association both in daily intercourse and in courts of justice. The association even entered State politics, held its own conventions, and indorsed its own candidates on the Whig and Democratic tickets. Its voting strength, five to six thousand voters, thus made a difference of double the number of votes in favor of the candidates whom it indorsed. It was openly favored by the Seward wing of the Whigs and the Barnburner wing of the Democrats. Its influence is visible in the following sections of article first of the New York State constitution of 1846: "12. All feudal tenures of every description, with all their incidents, are declared to be abolished. saving, however, all rents and services certain which at any time heretofore have been lawfully created or reserved. 13. All lands within this State are declared to be allodial, so that, subject only to the liability to escheat, the entire and absolute property is vested in the owners, according to the nature of their respective estates. 14. No lease or grant of agricultural land for a longer period than twelve years, hereafter made, in which shall be reserved any rent or service of any kind, shall be valid. 15. All fines, quarter sales, or other like restraints upon alienation, reserved in any grant of land hereafter to be made, shall be void." In all these sections the vested rights of the patroons were carefully respected, while the whole system of land-tenure was so expressly put under the ban for the future as to increase the anxiety of the patroons to make absolute sales and be rid of annoyances. In this way the transfer of the property had gone so far in 1850 that most of the difficulty then ceased, and the legislature at last ordered the attorney-general to bring suit against Harmon Livingston to try title. The suit was decided in his favor.

While this peaceable settlement was going on other means were attempted. At first, as in Ireland, the military force of the State was invoked, but it found no open enemy to subdue, and the *fiasco* was derisively termed "The Helderberg War." In Aug., 1845, an officer named Steele, while engaged in a distress for rent at Andes, Delaware co., was shot and killed. Gov. Silas Wright at once proclaimed the county in insurrection, as it was the most prominent in the affair, though the Anti-rent association had by this time spread to some seventeen counties. A special court of oyer and terminer was held by Judge Amasa J. Parker, and Attorney-general Martin Van Buren obtained the conviction of two persons for murder. Their punishment was commuted to imprisonment for life by Gov. Wright, and his Whig successor, Young, pardoned them in 1847, the violence having by that time subsided. Fifty-four other persons, imprisoned for minor offences of the same origin, were pardoned at the same time.

For the manor of Rensselaerswyck see 1 Hildreth's *United States*, 142; 2 Bancroft's *United States*, 279; Munsell's *Annals of Albany*. For Livingston manor see 3 *Documentary History of New York*, Dougan's patent of 1686 at p. 373, and maps at pp. 414 and 498; Sutherland's *Deduction of the Livingston Title;* Hunt's *Life of Edward Livingston*, ch. i. See also Jay Gould's *History of Delaware County;* Mrs. Willard's *Last Leaves of American History*, 16–18; Jenkins's *Life of Silas Wright*, 179-226; 2 *Whig Review*, 577-598. (A. J.)

ANTONELLI, Giacomo (1806–1876), a Roman cardinal and statesman, was born in Sonnino, on the borders of Naples, April 2, 1806. His father was a woodcutter, and the family is said to have comprised at an early period some persons of distinction, though also some robbers. After his birthplace was destroyed in 1819 by the pope's soldiers as a nest of brigands, Antonelli removed to Rome, and while attending the seminary there attracted the notice of Pope Gregory XVI. Having taken minor orders, he was made a court-assessor, and afterwards delegate at Orvieto, Viterbo, and Macerata. His energy and activity in these places commended him to the favor of his superiors, and in 1841 he was appointed under-secretary in the department of internal affairs. Three years later he was transferred to the more important department of finance, then in a very confused state, and in 1845 was made the minister of finance. After the accession of Pius IX. he continued to hold this office, and on June 11, 1847, he was made a cardinal-deacon. Though under Gregory he had opposed the liberal party, he now made concessions to their demands, and was for a time the head of a cabinet of nine ministers, only three of whom were ecclesiastics. His popularity was increased by his despatching an army of 17,000 men against the Austrians. But the liberal current was too strong for him, and in 1848 he was compelled to retire. Yet he remained near the pope, and the influence which he acquired over Pius IX. was unabated. By the advice of Antonelli the pope fled from Rome to Gaëta, Nov. 24, 1848. When the Roman Republic was proclaimed, Antonelli issued a circular to the Catholic powers inviting their intervention. A French army was sent in response, and Rome having been captured, the restoration of the papal authority was proclaimed July 15, 1849, though the pope himself did not return till the following April. Then Antonelli was made minister of foreign affairs, but had, in fact, the control of the entire administration. His policy was now wholly reactionary, and its effects were disastrous; the disaffection of the people increased, trade was destroyed, and brigandage flourished. In spite of serious opposition to his measures at home and abroad, Antonelli remained unshaken in the confidence of the pope. As the movement for the union of Italy went on, the cardinal-secretary issued protests against the successive encroachments on the pope's temporal power, and by his diplomatic skill delayed, though he could not prevent, the formation of the kingdom of Italy and the establishment of its capital at Rome. When, on Aug. 21, 1870, the last French troops were withdrawn from Rome, he issued an ineffectual appeal to the other European powers for assistance. A month later the Italian troops took possession of the capital, and Victor Emmanuel made his formal entrance in November. When the pope's temporal power was thus abolished, some of his friends urged him to depart from Rome, but Antonelli successfully resisted the movement. Though he had been completely defeated in the great struggle of his life, he continued to display his habitual adroitness in the further conduct of foreign affairs, and had some success in the politics of Spain and Germany. He died at Rome, Nov. 6, 1876. His princely fortune, which included one of the finest collections of gems in Europe, was left exclusively to his three brothers, who had already become rich through his favor. In 1877, Countess Loreta Lambertini, alleging herself to be the daughter of Antonelli, applied to the civil courts for a share of his estate. The heirs, without disputing her relationship, resisted her claim as illegal, and it was finally rejected by the courts in July, 1879.

ANTS. The ant is a true insect, belonging to the sub-order *Hymenoptera*. It is fossorial and social; that is, burrows in the earth and lives in communities. As American ants have never been monographed, the number of indigenous species is not known, but it is certainly very great. The writer has studied more or less thoroughly, or personally examined, 155 species, including those from Mexico which are likely to be found in the parts of the United States bordering that country. Including the descriptions of Smith, Buckley, Norton, and Roger, the number of known North American ants must exceed 200 species, many of which require reclassifying. The writer has in his possession a number of unnamed and undescribed species, and a vast field is yet unexplored which must yield to the future collector and student a rich harvest, and greatly multiply the known species.

See Vol. II. p. 84 Am. ed. (p. 94 Edin. ed.).

§ I. Form and Structure.

In appearance and structure the ants closely resemble bees and wasps. Ordinarily, a formicary consists of the following forms: (1) One or more fertile queens; (2) virgin queens, winged; (3) males, winged; (4) workers-major; (5) workers-minor; (6) dwarf workers, or minims. To this some species add (7) a soldier, who is known by an excessively large head. Some ants, as the cutting ant, have still smaller forms of workers; many have only the major and minor besides the sexed forms. One genus, *Anergates*, has no known worker. The workers, or "neuters," differ little in organization from queens, and indeed may be considered as undeveloped females destitute of wings. The ant's body is

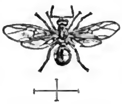


FIG. 1.

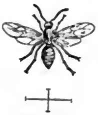


FIG. 2.

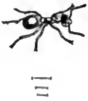


FIG. 3.

divided into the head, thorax, and abdomen. The brain, or anterior portion of the nervous system, is located within the upper and central part of the head, and considering the wonderful intelligence of this little creature, as Mr. Darwin has well said, it is the most marvellous atom of matter in the world. The antennæ, or "feelers," have an outer piece, the flagellum, which has from six to seventeen joints (usually from ten to thirteen), the number and form of which give good specific characters. The two eyes are compound, as in the bees, consisting of facets as high in number as 1200 and as low as from 1 to 5. Besides these, many species have (usually) three ocelli, or simple eyes, disposed upon the superior part of the caput in a triangle with the apex in front. In some species the workers are without ocelli, which, however, are always present in the males and females. The mouth parts are the upper lip, or labrum; the first or upper pair of jaws, called mandibles; the second pair of jaws, or maxillæ; and the lower lip, or labrum, both of which are provided with a pair of palpi, the number of joints in which also give good characteristics. The mandibles are attached by strong muscles to the face, are usually more or less palm-shaped, concave within, armed with sharp teeth along the edge. They are powerful and useful instruments, serving for all the varied duties of emmet life, as digging, sawing, cutting, pinching, carrying, fighting. The thorax consists of a number of parts united in three divisions, prothorax, mesothorax, and metathorax. It bears on each side three pairs of legs, composed in order (from the body) of coxa, trochanter, femur, tibia, and tarsus. The tarsus has five segments, and terminates in a pair of strong claws, which also efficiently aid in the work of digging, etc. The abdomen has six segments in the queens and workers, seven in the males, counting the nodes of the petiole as segments. These in the abdomen proper are composed of two sets of plates, dorsal (above) and ventral (below), overlapping each other like tiles upon a roof. In many ants (*Formicidæ*) one segment, in others (*Myrmicidæ*) two segments, are detached from the abdomen to form the petiole, and are then known as nodes or knots. At the apex of the abdomen the stinging organs are placed. These in some species are rudimentary, and are used rather to eject formic acid into the wound made by the abrasion of the mandibles. In others the sting is similar to that of wasps and bees, and inflicts as painful a wound. The crop is contained in the fore part of the abdomen, and is connected anteriorly with a straight œsophagus, which runs through the thorax, terminating at the mouth. Posteriorly it is connected with a gizzard, stomach, and intestine. The liquids taken as food are retained within the crop as a store, and are fed by regurgitation to the larvæ, callows, sexed forms, and workers. When required for food, the sepals of the gizzard open and admit the liquid to the stomach.

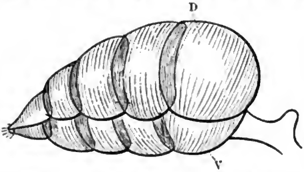


FIG. 4.—Abdominal Plates: D, dorsal; V, ventral.

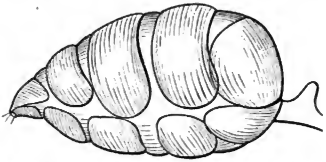


FIG. 5.—Abdominal Plates, separated by distended crop.

In all ants this crop is capable of great distension, the highly-elastic muscular membrane upon which the abdominal plates are attached separating to accommodate the expanding crop. In some species, the honey ants (*Myrmecocystus melliger*, Llave; *M. hortusdeorum*, McCook; *Camponotus inflatus*, Lubbock), this condition of the crop has become permanent in certain workers, whose abdomens assume a spherical shape, looking like currants or small grapes. The other alimentary organs are pressed by the crop into the ventral and apical parts of the abdomen. These workers or honey-bearers are sedentary, hanging to the roof of honey-rooms, where they are attended by the workers, and become a sort of vital honeycomb, yielding food to their co-formicarians in time of need. (See McCook on the *Honey and Occident Ants.*) The anatomy of ants has been worked out by Meinert, Forel, Lubbock, and others, and the agricultural and honey-ants (in part) by the writer.

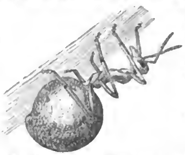


FIG. 6.—Honey-Ant hanging to roof of Honey-room.

§ II. ARCHITECTURE OF FORMICARIES.

Ants may be rudely divided, according to the character of the material by or within which their domiciles are wrought, into (1) mining ants, (2) carpenter ants, (3) arboreal ants. The division is not strictly marked, for the carpenter ants also burrow in the earth, and one species (*Camponotus senex*) is said to make paper nests in trees. Some of our mining ants, as *Aphenogaster tennesseensis*, cut homes in old stumps and dry toadstools; and *Crematogaster lineolata* mines, carves in wood, and makes a kind of rough-fibred paper out of decayed bits of wood for arching galleries and halls. The work of arboreal ants, who build nests in trees out of leaves, has its close analogue in the nests of the cutting ant, placed, however, under ground. Nevertheless, the above arrangement will prove convenient for description.

i. MINING ANTS.—Most ants are fossorial in their habits, dwelling wholly or in part in homes burrowed in the earth. The interior architecture of their nests is in all species examined substantially the same, being an irregular system of tubular galleries, tending more or less to arrangement in stories. That is to say, the galleries are driven generally in a horizontal direction, and as the formicary grows the burrows are not only extended laterally, but shafts are sunk and new galleries made, which may be roughly described as parallel to the first. They are continued according to the age and strength of the colony, and the parallels are all connected at intervals by vertical galleries. At various points these burrows are widened out into little chambers or caves, which serve as the dwelling-places of the family, as nurseries, as store-rooms for grain, and even as stables for the domestic herds of aphides and beetles.

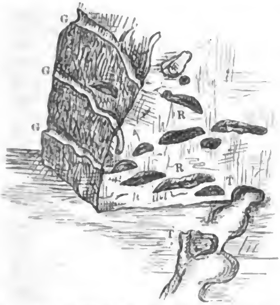


FIG. 7.—Vertical Section of Nest of Honey-Ant: R, rooms; G, galleries; T, suite of joined rooms.

These rooms are usually small, but in some species are three or four feet long and a foot high. Communication is had with the surface by one or two (sometimes more) openings or gates. These are the common gangways of the colony, are sometimes closed carefully during night and severe weather, and are nearly always guarded by sentinels, who sharply challenge all comers and in case of danger quickly alarm the nest. Sometimes the gates are carefully concealed (as with the slave species when near the slave-makers) for protection against natural enemies. Most of the mining ants confine themselves to subterranean dwellings, but others erect upon the surface large conical mounds, which are true homes. The mound-making ants of the Alleghanies (*Formica exsectoïdes*) are the best examples of these. They are found throughout the mountain-regions of Pennsylvania and the East, and abound on the New Jersey barrens. On Brush Mountain, Pa., is an "ant city" numbering nearly two thousand mounds, all of which seem to be more or less closely affiliated, and probably sprang from one original colony. The mounds are quite regular cones, and the largest measure three feet and a half in height and from twenty to forty feet around the base. These are composed chiefly of earth brought up from the interior excavations. When the mound is cut vertically through the apex by a saw, the vertical surface exposed presents a beautiful appearance, being perforated by tubular galleries arranged with almost the regularity of a honeycomb. Within these the ants dwell, taking refuge, as occasion requires, in the subterranean galleries. The eggs, larvæ, and pupæ

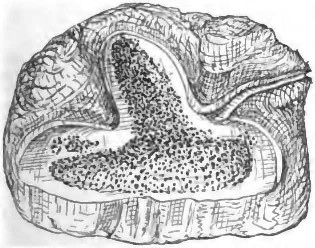


FIG. 8.—Seed-room or Granary of Pennsylvania Harvester (*Pheidole pennsylvanica*).

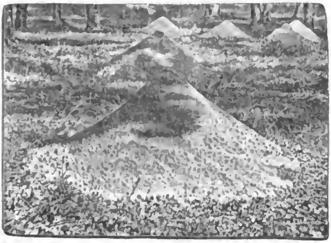


FIG. 9.—Nest of the Mound-making Ants of the Alleghanies (*Formica exsectoïdes*).

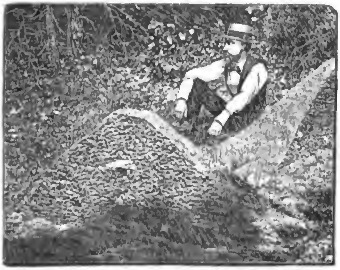


FIG. 10.—Interior View of Mound (*Formica exsectoïdes*).

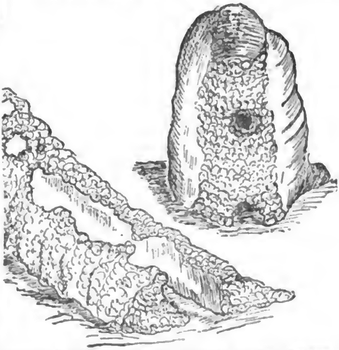


FIG. 11.—Mining: Process of building an arch (*Formica exsectoïdes*).

have thus the advantage of a home in which the heat and moisture can be graduated by simply carrying the young up or down. The galleries are constructed in a very workmanlike way, the pellets of earth being laid one upon another, and probably cemented by a secretion from the salivary glands. The arch is sprung easily and nicely, and the interior smoothed. During the process openings ("man-holes") are left for the convenience of the workers. During dry weather the ants do not work much upon their mounds, but a shower at once quickens their activity. In winter particularly the mounds are covered with bits of dry leaves, twigs, etc., and leaves are even cut off by them for this purpose. A similar padding or thatching has been observed by the writer upon the mounds of *Formica rufa* in the South Park of Colorado and on the slopes of the Rocky Mountains around Leadville. Among the mound-building ants may be classed the agricultural, occident, and honey ants distributed through the Western and South-western United States. These all have the habit, particularly the last two, of covering their mounds with the gravel brought up from the galleries underneath the surface.

ii. CARPENTER ANTS.—This name is popularly given to those species who excavate in wood the nests in which they dwell and rear their young. The genus *Camponotus* is especially distinguished for its workers in wood. There are several American species, as *C. pennsylvanicus*, *C. esuriens*, *C. socius*, *C. melleus*, *C. herculaneus*. The best known is *C. pennsylvanicus*, a large black ant distributed throughout the major part of the United States and Europe. The writer has studied the habits of this ant (*Trans. Amer. Entom. Soc.*, Philada., 1876) in Pennsylvania chiefly, where it breeds not only in growing timber, but in the lumber wrought into houses. The formicary of a large colony when opened presents the appearance of a labyrinth of cells, which, more carefully observed, shows an evident arrangement into stories and half-stories. The surfaces of the floors are uneven, but may be traced for considerable distances upon the same general level. Some of these have been formed by driving tubular galleries, which were continually and gradually enlarged, and finally blended. The appearance of corridors or halls is quite manifest, running parallel in series of two, three, or more. These are separated by columns and arches, or partitions, which have been cut very thin, in many spots being just broken through. Again, a section of a hall will be found entirely enclosed, forming a triangular chamber which looks like a bay-window projecting over a walk. The opening to this is by a little window. This series of galleries is terminated above or surmounted by an irregular dome, which, with its pendent columns, presents a striking resemblance to the roof of a limestone cavern with drooping stalactites. Above the dome, and communicating with it by at least two tubular ascents, is an irregular vault, or series of vaults, varying from three-fourths of an inch to three inches in height. The floors, walls, and roofs of these cavities are tolerably smooth. The first-described series of excavations may be termed *columnar*, and the second *cavernous;* the two together give a good idea of the interior architecture of a carpenter ant's nest.

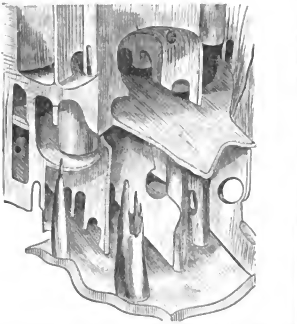


FIG. 12.—Halls and Galleries of Carpenter Ant (*Camponotus pennsylvanicus*).

The external entrances to the formicary are circular and oblong doors pierced at irregular intervals. They open for the most part into tubular circuitous galleries communicating with the interior. Some of them, however, enter immediately upon spacious vestibules, which may have been used when occasion required that the larvæ and pupæ should be brought nearer to the air. The location of these doors, in connection with the general arrangement of the galleries, appears to give ample facility for ventilation. These cuttings are made by the worker ants with their mandibles. They doubtless avail themselves of the openings made by various boring insects, and are found nesting in decaying wood; but they have frequently been seen by the writer in sound lumber and standing trees, and in the pine regions good logs are often found ruined in part by their work. They may often be seen on the trees around our city squares and suburbs thrusting out their black heads from openings in or around the bark, and dropping yellow chippings, which are taken up by gangs of workmen from the ground beneath and dumped into the gutter or among the grass at some distance. Among the carpenter ants may also be placed the species of *Leptothorax*, small ants that live in the bark of trees.

iii. ARBOREAL ANTS.—These make their nests of the leaves of trees, and may be divided into two groups—those who make leaf nests under ground and those who make leaf nests pendent upon trees.

1. UNDERGROUND LEAF NESTS.—The cutting or parasol ant furnishes an example of this form of nest. At least three species are found in the United States, the best known of which, *Atta fervens*, is found in Texas and other parts of the South-west. (The writer's studies thereon are abstracted in *Proceedings Acad. Nat. Science*, Philada., 1879.) This ant excavates immense domiciles in the earth, the central nest sometimes being as large as the cellar of a small house. From this there radiate in all directions underground tunnels, which here and there enlarge into caverns of various sizes, some three feet long by twelve inches deep and eight high. Within these chambers were masses of a very delicate leaf-paper wrought into what may properly

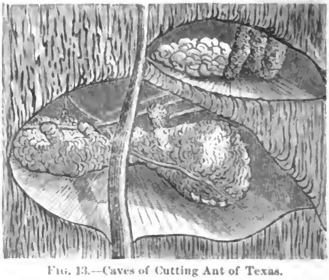


FIG. 13.—Caves of Cutting Ant of Texas.

be called "combs." Some of the masses were in a single hemisphere, filling the central part of the cave; others were arranged in rude columns two to three inches high, in contact along the floor. Some of these columns hung like a rude honeycomb or hornets' nest from roots that interlaced the chamber. The material was in some cases gray, but in others of a leaf-brown color. It was all evidently composed of the fibre of leaves which had been reduced to this form within the nest, probably by the joint action of the mandibles and salivary glands. They were arranged into cells of various sizes, irregular in shape, but maintaining pretty constantly the hexagon. Some of the cells were one inch deep, and usually narrowed into a funnel-like cylinder. Ants in great numbers, chiefly of the smaller castes, were found within these cells. In some were also great numbers of larvæ. Evidently these paper nests furnished a habitation and nursery for the young. The leaves out of which these masses are manufactured are cut from the surrounding trees, generally in the night. The gates or openings to the surface are carefully piled up and covered over with bits of dry leaves, twigs, and other litter, and remain closed during the day. At nightfall the litter is removed, and the workers issue forth in numerous armies. These are composed of seven or eight apparently distinct forms or castes—the soldier, distinguished by a very large head, being seven-sixteenths of an inch long; worker-major, six-sixteenths; worker-minor, five-sixteenths; and smallest minim, only one-sixteenth of an inch. The minims appear to confine their labors to nursing the young and enlarging the nest. The cutting of the leaves is done by the majors, minors, and some of the larger minims; the soldiers precede the excursion columns as they move along the ground or out and up the tree, and afterward on the return, as though engaged as scouts or pioneers. The cutter grasps the leaf with outspread feet and makes an incision at the edge by a scissors-like motion of her sickle-shaped toothed mandibles. She gradually revolves, steadily cutting as she does so, describing a circle or the greater portion thereof. The cut is a clean one quite through the leaf, and the portion clipped out is about the size of a dime or sixpence. The piece when cut is thrown back by a quick motion, seeming to be lodged on its edge within a deep furrow that runs along the entire median line of the head except the clypeus. Spines on each side of this furrow help to support the leaf. Thus loaded, a long column will be seen moving along, looking like a liliputian army of Sunday-school children bearing aloft their banners. The leaves are borne into the holes or gates, and are reduced within to the paper nests described. The sap of the leaves probably serves for food. These ants were also seen by the writer in Texas carrying away from a granary great quantities of wheat, grain by grain; this was also doubtless ground up by mandibular mills under ground, and served both for food and building-fibre. The tunnels made by these ants in their excursions after food are often very long. One was measured 669 feet in length, with two branch tunnels to a peach-orchard 120 feet distant; it had an average depth of about eighteen inches, but in places descended to the depth of six feet. The cutting ants prefer plants with a smooth leaf; are severe upon grapes, peaches, China tree, radishes; take celery, beets, young corn and wheat, plum, pomegranate, honeysuckle, Cape jessamine, crape myrtle, althea. They do not like lettuce, and will not take the paper mulberry nor figs and cedar, except the bud-ends in the scant days of winter. They love sugar, grain, and tobacco.

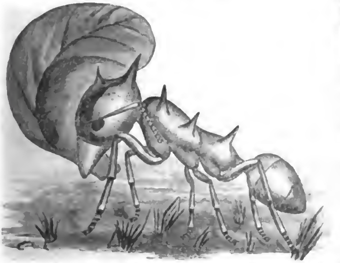


FIG. 14.—Cutting Ant carrying a leaf.

In form the exterior architecture is simply a flat clearing covered with raised circles or lunettes of soil brought up from below; or an irregular mound caused by the accumulation of quantities of the excavated earth. The Northern cutting-ant (*Atta septentrionalis*, McCook) is a northern species, recently discovered at Island Heights, New Jersey. It feeds principally upon the leaves of the pine, and out of them constructs underground nests which are little models, almost toy-like in their mimicry of the Texas species. When studying this species the writer was at once impressed by the striking contrast between the vast myriads of workers, the extensive excavations, and the formidable and vigorous activities of the Texas colonies, and the small numbers, slight excavations, and apparently sluggish movements of their northern congeners. He could not forbear the thought that these New Jersey communities of *Atta septentrionalis* seemed like the feeble remnant of a vigorous race left or thrust by some untoward change upon unfavorable sites, which must work toward their extinction.

2. PENSILE ARBOREAL NESTS.—These are nests composed of various fibres, chiefly that of leaves, more or less desiccated, and suspended to the branches of trees. Both in structure and in site, therefore, they approximate the nests of the paper-making wasps. They differ little in character from the nests of the cutting ants, and are chiefly distinguished by being swung aloft instead of within subterraneous caverns. In these points also we observe the analogy between the habit of ants and that of wasps and bees, both of whom have representatives who build arboreal nests upon trees and on or within the earth. Representatives of this class of formicary are comparatively rare: certainly not many are known to science. Mr. F. Smith, in his *Catalogue of Hymenopterous Insects in the British Museum*, gives figures of several fibrous nests made by arboreal species of ants—*Crematogaster* (*Pachycondyla*) *montezumia*, from Mexico, *Polyrhachis textor*, from Malacca, *Formica gibbosa*, from India, and *Crematogaster arboreus*, from Port Natal. Dr. Forel, in his *Études Myrmécologiques* for 1879, speaks of a Mexican species of *Camponotus* (*C. senex*) in the collection of Saussure as bearing the label "Nids de papier dans les branches"—nests of paper in the branches. These two, *P. montezumia* and *C. senex*, are the only North American tree ants of which we have any knowledge. An Australian species, *Crematogaster læviceps*, builds a pensile nest somewhat in the fashion of our hornet, upon trees. It contains a labyrinth of curved galleries and cells centring upon the interior. *Formica bispinosa*, of Cayenne, forms a nest of cottony matter from the capsules of *Bombax*. In Brazil this species, the *Polyrhachis bispinosus*, is popularly known as the "negro-head ant," the globular nest, covered on the exterior with little projections, being suggestive of close woolly hair. Smith says that the material of which it forms its nest furnishes an article of commerce used as tinder for lighting cigars, etc. *Myrmica kirbii*, an India species described by Lieut.-col. W. H. Sykes, which is apparently a species of *Crematogaster*, makes a formicary in the branches of trees out of the droppings of cows. These it spreads in thin, flaky, overlapping folia, like shingles or tiles. A dome-like roof covers the summit in an unbroken sheet, like

a skull-cap on a man's head. The interior consists of a multitude of irregular cells, formed of the same material as the exterior. The green ant (*Œcophylla virescens*) builds an arboreal nest of dead leaves, from which it often drops down in bevies upon travellers, very much to their discomfort. The nest is about eight inches in diameter, and is made of a leaf-pulp—as the hornets' nest is of a pulp of wood-fibre—and is hung among the thickest foliage, being sustained not only by the branches, but by the leaves which are wrought into the nest and in parts project from the outer wall. Mr. Foxcroft discovered an African species of *Œcophylla* which, when disturbed, swarmed in excited legions upon the outside of their papery domicile, against which they pattered so vigorously as they moved that the observer thought the rain was falling upon the leaves above. Mr. W. H. Patton has described an indigenous species, *Stenamma gallarum*, as inhabiting a gall upon a dead but unbroken stock of golden-rod. Mr. Smith describes a species (*Pseudomyrma modesta*) collected in Panama which nests in the spines of a species of acacia. The spines are three inches long, and the entrance to the formicary is a small hole gnawed near the point. There are no cells within, and this is probably (as the similar cases alluded to may be) simply an example of "squatter sovereignty." Mr. Edward Norton (*Trans. Am. Entom. Soc. Phila.*, vol. ii., 1868–69, p. 44) has described similar species in the Mexican collection of Prof. Sumicrast. In addition to the above is the China orange or tree ant referred to under section viii., "Ants as Beneficial Insects" (*q. v.*).

§ III. Queen-Life—Development and Growth of Young.

The "winged ants" which sometimes excite surprise, and are reported to naturalists as curiosities, are simply the virgin queens or young females and the males. These are reared in the nest by the workers, upon whom they are entirely dependent for food. They may occasionally be seen gambolling about the door of the formicary or close at hand, but are not permitted to venture far away until the close of summer or early autumn, when they leave or are driven from the nest. September is the month usually taken for this "swarming" or "marriage-flight." In the evening of a warm day the air will be found full of the winged lovers engaged in courtship. In the act of mating the female flies in natural position (back upward), while the male reverses this position (back downward), the genital organs, which are at the apex of the abdomen, remaining united as the insects fly. The number of males is usually in excess of the females. After the marriage-flight the males sink to the ground, where they continue a precarious existence of a few days, and are devoured by birds and other insectivorous creatures, or perish. They are not provided with weapons for defence, attack, or labor, the mandibles being blunt or but faintly toothed. Their sole function in life is that which pertains strictly to their sex. There is room to believe that the females are also fertilized before leaving the home nest. The writer has recorded flights of the shining slave-maker (*Polyergus lucidus*) and the familiar garden-walk ant (*Lasius flavus*) in which the females flew away solitary, and were followed to very great distances before they descended or were lost to sight. In such cases it is probable that fertilization occurred before flight, if at all. The winged sexes seem loath at times to leave their home, and are urged forth by the workers, who nip them with their mandibles, following them with that intent up the adjoining blades of grass, sprigs of fern, clover, etc. The number of the sexed forms reared in a large formicary is large, and in the fall, when many nests are at once pouring out their swarms, the air is filled with clouds of insects. Travellers upon the American plains have sometimes been "attacked" by these swarms, and have been stung by the females more or less severely. In the case of the occident ant (*Pogonomyrmex occidentalis*) this would be a severe punishment. The attack is probably only the attempt of the creatures to settle upon the first elevated object in their path, and the sting the result of anger produced by natural attempts to brush them off. An immense swarm of *Myrmica lobicornis* occurred a few years ago in the Alleghany Mountains, the insects striking in their flight the workmen on the summit of a new court-house building in Hollidaysburg, Pa., and stinging them.

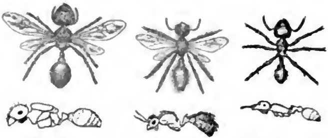


Fig. 15 *a*. Fig. 16 *b*. Fig. 17 *c*.

Figs. 15, 16, 17.—Occident Ant: *a*, virgin queen; *b*, male; *c*, worker.

After fertilization the female tears off her wings, partly by biting and partly by contortions of the body; her life under ground makes such appendages not only useless, but cumbersome. In Texas the swarms of the agricultural ant sometimes enter houses, and the discarded wings have been gathered up by handfuls. The sexual migration of the males and females of this species is a scene of great excitement and tumult. The young fertilized queens, being denuded of wings, seek a convenient site and begin to burrow into the ground with a view to founding a new colony. Multitudes of them fail in this, being destroyed in various ways. Indeed, were there not vigorous natural checks to their increase they would soon cover the face of the earth.

The progress of a successful colony may be thus described, the general features applying to most species, among whom, however, the details more or less vary: When a gallery has been sunk of sufficient depth to ensure safety, or a sheltered position acquired underneath a stone, the queen in due time deposits her first eggs, which are carefully reared and the white larvæ nursed and nourished. This first brood consists wholly of workers, and numbers thirty or forty with some species, but is much smaller in others. The mother-ant seeks food for herself and nourishment for her young until the ants of the initial brood are matured, when they take up the burden of the outdoor work, supply with food the rapidly increasing family, as well as the mother-queen, join in the nursery duties, labor at enlarging the subterranean quarters, and, in short, become, as they continue to be, the real *workers* of the community. The first duty that a worker undertakes is that of a nurse; at least the callow ants, scarcely out of the shell, have been seen engaged in the care of the grubs. The future history of the queen is hidden

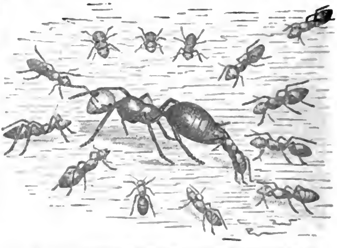


Fig. 18.—Ant-Queen surrounded by her body-guard.

within the dark, subterranean chambers of the nest, which she rarely leaves. If ever she is permitted to enjoy the open air and a promenade around the entrance to her domain, it is under the most cautious conditions for her safety and the closest surveillance of her body-guard. Queen though she be, she is least free of all within the community. She lays innumerable eggs, from which in order grow the various forms of workers, the males and the females; she is fed and cared for by the workers, who continually surround her in a sort of "court." She probably assists somewhat in the nursing of the young, and may contribute something of her strength, in feeble families at least, to the extension of the formicary bounds. Several queens may exist in a large nest, and workers have been seen after a marriage-flight seizing and dragging into a formicary the newly-fertilized queen, apparently to add to the resources of the colony. The quantity of eggs laid by a queen is very great, as must needs be in order to repair the immense waste of life continually going on among the workers, among whom the mortality of every day's active work wellnigh equals that of a pitched battle. Occasionally, workers—who are really immature females—are found who also lay eggs, from which, however, so far as observation goes, none but males are produced. The workers probably rarely survive the summer succeeding their hatching, but some undoubtedly live longer under favorable conditions. The queens live much longer. In the winter of 1881–82 the writer was shown a queen in the formicaries of Sir John Lubbock at High Elms which had lived since 1874; it is living at this date (Dec., 1882), and is eight years old. The same naturalist had workers only one year younger.

The life of the ant has four well-marked periods: first, the egg; second, the grub or larva; third, the chrysalis or pupa; fourth, the imago or perfect insect. The eggs are minute white or yellowish elongate-ovate objects. They hatch in about fifteen to thirty days. The larvæ are white, legless grubs, quite robust at the apical end and tapering toward the head, somewhat like a cornucopia or a squash. Both eggs and grubs are incessantly and carefully tended by the workers, who lick them, feed them (grubs), carry them back and forward during weather changes, fly with them or fight for them during the assaults of enemies, and often show a species of attention that has an amusing resemblance to the dandling of an infant by a young mother. The grubs are often assorted according to age and size, reminding one of the class-divisions in a school-room. The larval period differs in the various species, some larvæ maturing in less than a month, others living through the winter. When the larvæ of some species pass into pupæ they spin a whitish or straw-colored cocoon, looking not unlike a grain of wheat. These cocoons are popularly and erroneously known as ant-eggs. Other larvæ do not spin a cocoon, but spend the pupal period naked. When the pupæ mature, the callow ant is helped out of the shell by the workers, who may also be seen carefully unfolding the legs and smoothing out the wings of the sexed forms. During the pupal state, of course, no food is taken, but the young creatures are still the objects of unwearied devotion on the part of the workers. Indeed, the whole life of the formicary may be said to centre upon and gather around the young—a degree of civilization which many human communities have scarcely yet reached.

§ IV. Food and Feeding Habits.

The food-supply of ants is largely drawn from insects yielding sweet excretions or secretions, from the nectar and sugary exudations of plants, from fruits, from the oils of nuts, seeds, etc. They are also largely scavengers. Dead insects and animals of all kinds, refuse of many sorts, afford them nutrition, but they do not limit their insectivorous tastes to mere scavenger-work: they also prey upon living insects. This is true of our indigenous ant-fauna, although we have no such wholesale insecticides as the famous *Eciton* or driver ant of Africa and South America, whose raiding columns clear out every living insect within their broad sweep. Several species of *Eciton*, however, are found in the tropical parts of Mexico, with habits similar to those described by Norton and Sumierast. The mound-making ants of the Alleghanies have been seen preying upon our native termite or white ant (*Termes flavipes*) when the nests of this insect had been uncovered by turning up stones upon the mountains in search of specimens. It was surprising to note how quickly the *Formicas* appeared on the scene, seeming to dart out from behind every blade of grass, stick, and stone, and, leaping into the galleries that threaded the flat pit of the stone, seized with avidity the soft white *Termes* and made off with their prey. These ants and many others have been seen capturing flies even on the wing, and frequently bringing home to their nests various insects still living or recently killed. So also the agricultural ants of Texas have been seen after a shower to break suddenly out of their formicary, scatter throughout the foliage, and return with immense numbers of living insects beaten down by the hard rain. Forel says that throughout the bounds of an ant-city of *Formica exsecta* in Switzerland, covering many acres, he was not able to discover any other species of ant except a few nests of *Tetramorium cæspitum*, who owed their exemption to their superior agility. This is true in some measure of the allied *F. exsectoïdes*, in our mountains and the New Jersey barrens. In addition, it may be stated that ants are veritable cannibals, destroying and feeding upon not only individuals of their own family, but those of their own species. In the same connection may be mentioned a custom of American Indians to put furs and blankets infested by insects near the mounds of the occident ant, in order to have them cleaned out by the insectivorous emmets.

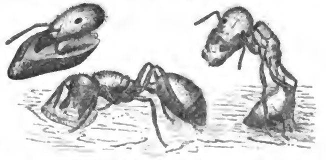


Fig. 19.—Ants feeding from seeds by lapping or licking.

Ants have not the power of eating solid substances, but lick or lap up their food, something after the manner of a cat taking milk. One very common source of food is found in the sweet substance known as honey-dew, excreted abundantly by plant-lice or aphides. These insects gather in large groups upon plants, whose tissues they pierce and feed upon the sap. This issues from the aphis in the form of a minute transparent drop of sweet liquid or sugar-water, which the ants are exceedingly fond of. They hover over the aphis, lick up the honey-dew as it exudes, and in order to induce the exudation they gently stroke the insect with their antennæ, thus securing its complaisance, somewhat as the milker persuades the cow to give down milk by gentle manipulation of her udders. These aphides are even domesticated within the formicary, and survive during winter upon the roots of plants. In early spring, by turning over flat stones in dry or sandy soils, these aphis-herds, accompanied sometimes by Coccidæ in separate groups, will be found clinging to the lower surface of the stone, under the careful shepherding of their emmet hosts. The aphides and coccids are in good condition, having evidently well wintered, and are thus brought out to enjoy the gathering warmth of the season. Upon being disturbed, the ants seize their "cattle" in their mandibles and bear them quickly into the galleries. These are the "ant-cows" often referred to in popular speech; and certainly the analogy is striking enough to justify the language. Some species (*Crematogaster lineolata*) occasionally shut in the aphides when herding on plants by building over them a composite arch of earth and fibres of dead wood. It has also been proved that the ants actually breed their tiny cattle, rearing them from the egg with as much care as their own larvæ.

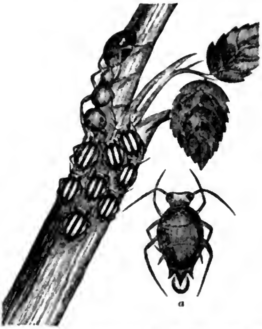


FIG. 20.—Ant attending an Aphis herd. *a*, Aphis.

The larvæ of a certain butterfly (*Lycæna pseudargiolis*) also yield food to the ant, peculiar organs on one of the hinder segments emitting a drop of fluid which the ants lick up, attending the caterpillar for this purpose very much as they do the aphis. Besides aphides and Coccidæ, other insects live in formicaries, but whether or not they are useful for food, or what purpose they do serve, is not known. Most of these ant-guests are beetles. Some of them, as the little *Claviger*, are quite blind, and are found only in ants' nests, the proprietors thereof taking as much care of them as of their own young. A little white wood-louse is found habitually living in ants' nests, and is supposed to be useful as a scavenger. The seeds of many plants and various cereals also furnish food for some species. These are known as harvesting ants.

§ VI. MARTIAL AND SLAVE-MAKING HABITS.

The wars of ants have attracted wellnigh universal attention. There is a difference in the martial spirit existing among the species of these little people, but as a rule all ants are courageous and warlike in the highest degree. Their nests, and sometimes also their feeding-grounds and roadways, are regularly guarded by sentinels, by whom all intruders are attacked with a fury that is absolutely regardless of consequences. In these conflicts the stings are freely used by those who possess them, while the stingless species throw jets of formic acid against their foes. But the chief weapons of offence and defence are the mandibles, which are used with terrible effect. Every part of the body is seized, but a favorite point of attack is the neck, to which the mandibles are applied like a guillotine and the head severed from the body. With some species decapitation is the favorite mode of assault, and the dissevered heads of the ants may often be seen clinging to the limbs of their adversaries, the jaws still clasped in the rigor of death. The emmet-conflicts frequently amount to pitched battles, in which vast numbers of opposing warriors are engaged. These fights are not only waged between alien species, but (as with the genus *Homo*) even more frequently and bitterly between colonies of the same species. Our "pavement ant" (*Tetramorium cæspitum*) seems to be especially belligerent. Early in the spring, as soon as the season has gathered a comfortable degree of warmth, the insects are seen issuing from the gravel or soil of garden-walks, or from the earthen seam that binds together the bricks of pavements, to engage in battle with the members of some adjoining nest. This is a very familiar sight to many city people. The numbers engaged are incredibly large; the ferocity of the conflict is quite equal to that of larger creatures, as are also the valor and endurance displayed and the mortality resulting. The centre of the battle is a wriggling mass of struggling life, which towards the margin thins out into groups, and still farther into a fringe of duels between single combatants of the factions. These may be lifted in the hand and transferred to vessels and boxes without in the slightest degree relaxing the furor of combat. Many of the combatants will be found variously maimed, and the dead and dying scattered over the field. The cause of these wars is rarely apparent, but in some cases, at least, they seem to result (as in human wars) from the embroilment of individuals extending to the respective nations, and to arise over somewhat similar objects, such as interference with each other's supposed domain, greediness to possess rich "finds" in entirety, mere stubbornness and quarrelsome disposition. One case may illustrate—a fight between two nests of pavement ants. The warring insects were spread thickly over a surface of nearly a square foot of the sidewalk, quite near the curbstone. The centre of the struggling mass was a quantity of fatty matter which had been thrown on and around the seams of the bricks through which a large formicary had made its gates. From the battle-field a column of ants three or four ranks deep stretched along a depression caused by a shallow surface-drain to a second nest just under a gate that led through a wall into the house-yard. Evidently, the ants from the curb-formicary had fallen upon the unctuous treasure which had dropped by their door, but had been disturbed in their "feast of fat things" by stragglers from the gate-nest. The stragglers were attacked, and perhaps driven away. They returned reinforced, and were again attacked; messengers ran to the gate-nest for reinforcements; fresh squadrons issued from the curb-colony, and thus the battle grew. When it was first seen, a single line of ants was running headlong from battle-ground to gate, and a double rank from gate to battle-field. The ants in these columns were in the utmost agitation. As they hurried along, fairly aquiver with excitement, they suggested strongly the outward mien and behavior of human beings running to and fro from a fire, a mob, or a fight. It is probable that many similar conflicts originate in like rivalries for the possession of food. Some conflicts, however, are veritable wars of conquest, in which a formicary is invaded, besieged, defended, preserved, or conquered and plundered. Such warfare is waged chiefly by the slave-making or kidnapping species, and the chief objects of plunder are the larvæ and cocoons, which are transported (sometimes along with their nurses) to the victors' nest, there to be reared, and become associate citizens in the labors, duties, and privileges of the community. There are two known species of American slave-making ants—the red slave-maker (*Formica sanguinea*), identical with the European species, and the shining slave-maker (*Polyergus lucidus*), which differs little from the European *P. rufescens*. In habits the two also resemble their European congeners. The habits of the *Sanguinea* are well described by Mrs. Mary Treat in her *Chapters on Ants*, and the shining slave-maker by the writer in *Proc. Acad. Nat. Sci.* (Philadelphia, 1880). The latter is remarkable from the fact that it has entirely lost every ordinary emmet aptitude except that of fighting. It is wholly dependent upon the associated captive workers for a home not only, but even for food and feeding, as it appears not to possess the ability to feed itself, and is fed by its slaves, without whose attention it perishes. Yet in the matter of warfare it displays tremendous energy and ability. *Sanguinea*, on the other hand, possesses all the race-endowments in full vigor. The ants most persistently enslaved are *Formica fusca*, a black ant, and *F. Schauffussi*, a reddish-yellow species. Other ants are kidnapped, but the above show the greatest adaptability to this form of associated life, although they conduct independent formicaries with normal energy. Their condition in the adopted nest appears to be little if at all different from that of ordinary workers in their native formicaries. Mr. Darwin has conjectured that the slaveholding instinct may have originated from the unintentional rearing of pupæ collected for food, who, proving themselves useful and congenial inmates of the nest, suggested the collecting of pupæ to be reared. Thus arose a habit which by natural selection was strengthened and made permanent, and finally increased and modified until an ant was formed as abjectly dependent on its slaves as *Polyergus*. Whatever credit we may give to this ingenious hypothesis, it must be said that in the case of our *Formica Schauffussi* natural selection has not operated to degenerate the soldierly courage and faculty, and remand the duty of defence wholly to those associates in whom the military faculty has been specialized; for *Schauffussi* is a determined warrior. In other words, if *Polyergus* has become specialized as a warrior, dropping an original ability and disposition to labor, her slave has not become specialized as a worker or dropped her combative faculty, but seems to be possessed in all respects of the normal nature and habits of ants of her species. One, therefore, who accepts Dr. Darwin's suggestion must allow that natural selection has wrought towards specialization in one section of the colony, but has been suspended in its operations upon the other section. It is doubtful if the anomalous conditions thus raised be not more difficult to explain than the original conditions to which the hypothesis was applied. It may be added that the red slave-maker has suffered no deterioration in her ability to feed herself and to work, although the principal work of her community appears to be done by the captive *Fuscas*.

§VII. Personal Habits and Peculiarities.

1. *Toilet Habits.*—Ants are the neatest of creatures in their personal habits, and, although habitually burrowing and digging in the dirt, are rarely seen in an untidy condition. Such minute particles of dirt as cling to the body are carefully removed. The whole body is frequently and thoroughly cleansed, a duty which is attended to after eating and sleep. In this process the ants assist one another, which makes a general "washing up" an exceedingly curious sight to witness. The cleanser begins at the face usually, which is licked thoroughly by the rugose tongue; even the mandibles or jaws are cared for, they being held apart for convenient manipulation. Thus, in order, the whole body is cleansed. The attitude of the cleanser is meanwhile one of intense satisfaction, resembling that of Puss when one is scratching the back of her head. When engaged in self-cleansing the ant uses the spur, a small toothed comb with a pointed attachment to the tibia. By means of this the "back hair," or hairs upon the back of the head, the sides, etc., are combed out. The comb closes upon a similar but coarser toothed arrangement upon the tibia, and through the two approximated combs the antennæ and legs are drawn for cleansing. The apex of the abdomen is cleansed chiefly by the tongue, and for this purpose some very grotesque attitudes must be assumed. This tidiness extends to the young, who are continually undergoing "the bath," appearing to enjoy it more than the average child.

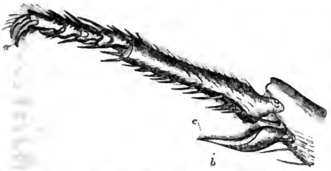


FIG. 21.—Foot and Spur-comb: *a*, claw; *b*, spur; *c*, comb.

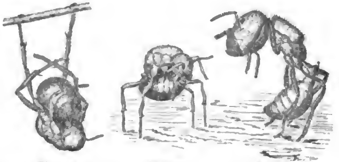


Fig. 22 *a*. Fig. 23 *b*. Fig. 24 *c*.

FIGS. 22, 23, 24.—Ants at their toilet: *a*, *b*, licking off the abdomen; *c*, brushing the head hairs.

Funereal Habits.—All species whose manners the writer has observed are quite alike in their mode of caring for their own dead and for the dry carcasses of aliens. The former they appear to treat with some degree of reverence, at least to the extent of giving them a sort of sepulture without feeding upon them. The latter, after having exhausted the juices of the body, they usually deposit together in some spot removed from the nest. In captivity they invariably carry their dead comrades about, sometimes for three or four days, to find a suitable burying-ground, and at last deposit them in a spot as far removed as possible from the gates of the nest, thus establishing a sort of cemetery where the dead gradually accumulate. The red slave-makers never deposit their own dead with those of their black servitors, but lay them by themselves, not in groups, but separately, and take them a considerable distance from the nest. The dead blacks are laid in groups.

Sleeping Habits.—The habits of ants in taking sleep have been fully observed from artificial formicaries of the agricultural ant and the Florida harvester. Invariably, when the gas-lamp upon the table was lit at night, numbers of ants would come out from the galleries and underground cells, where they spent most of the time, and gather in clusters against the surface of the glass or upon the soil next the light, where they fell asleep. They liked little elevations for that purpose, but some hung to the glass, from which they dropped off when they got asleep. Some squatted down upon their abdomens and last two pairs of legs; some lay upon their sides; some rested on their hind legs, standing tiptoe against the glass; some crouched upon the earth with face downward; several were piled one atop of another; all had the inferior faces and bellies toward the light. There was continually more or less agitation in the cluster, and frequent changes of position occurred. Some ants slept long and soundly; new ant-comers joined the circle and elbowed their way in, jostling the sleepers and partly or wholly arousing them. But in a group where numbers are evidently bent on sleep there is little change, and all the tokens of repose appear which are common to sleeping animals. The sleep is so sound that the feather end of a quill may be applied to the body, gently stroking it "with the fur," and indeed the neck be tickled, without arousing the sleeper. On waking the ants occasionally "yawn," and invariably begin to comb and lick their persons. The period of sleep varies, but may be estimated to be as long as three hours at times.

§ VIII. ANTS AS BENEFICIAL INSECTS—ECONOMY IN NATURE.

The *North China Herald* of April 4, 1882, contains an account by Dr. Magowan of Wenchow on the "Utilization of Ants as Grub-destroyers in China." This has suggested a paper by the writer on "Ants as Beneficial Insecticides," now (Dec., 1882) in press for the *Proceedings of the Academy of Natural Sciences of Philadelphia*, with a special view to the beneficial habits of American ant-fauna. In many parts of the province of Canton the orange trees are protected from destructive grubs by introducing to them colonies of two kinds of tree ants, whose species is not given and no description made except that they are red and yellow, and make upon trees nests resembling cotton-bags. The orange trees are colonized by depositing the ants on their upper branches; and to enable them to pass from tree to tree all the trees of an orchard are connected by bamboo rods. As is shown (see § I., "ARCHITECTURE OF FORMICARIES," iv.), the only North American species of which we now have knowledge that have nesting habits similar to those of the China orange ants are *Crematogaster* (*Pachycondyla*) *montezumia* and *Camponotus senex* of Mexico. There appears to be no good reason, however, why the Chinese species might not be colonized in the Southern United States. Some native ants might be more or less utilized for the same purpose. The question has already been raised, Do our ants exhibit in nature any special insectivorous habits that would make them natural protectors of crops? This has been considered at some length by the Agricultural Department of the United States Government in the matter of the cotton-crop. In a report on ants, prepared at the request of that department, the writer reviewed the testimony gathered from many and widely-separated sections as to the friendly offices of ants in destroying the eggs and larvæ of the cotton-worm. His opinion then was that, on the whole, those offices would hardly have an important commercial value, although to a certain extent beneficial. Many of the practical observers from whom information was collected spoke highly of the services of the ants, especially of one, "the cotton ant" (*Solenopsis xyloni*, McCook). These ants were particularly effective against the eggs, but attacked the larvæ also. So good an observer as Mr. Trelease ventures the opinion that ants are probably among the most important enemies of the cotton-caterpillar. One observer went so far as to think that the ants would ultimately destroy the cotton-worm should it prove to be indigenous rather than of foreign origin. All the ants considered in the above-named report are mining ants, and would therefore not be available for such uses as the species of the Chinese orangeries. It is not unlikely, however, that they might be useful on the orange trees of Florida, to which State some of them are native. But it would be a necessary condition that the ants should exist in such vast numbers as to compel, under the stimulus of hunger, a thorough canvassing of every neighboring object that might shelter available prey. The value of the Chinese orange ants appears to turn upon such conditions—viz., their limitation to tree surfaces as a foraging field and their vast numbers. In short, a limited supply of food and an immense demand for it constrain the ants to the most diligent garnering and careful gleaning. On the whole, there is little hope that these conditions can be met by artificial domestication of American ant-fauna.

But, whatever benefits the ant may be led by domestication to confer upon man, she already is entitled to consideration as a valuable, if not valued, friend of the race. The writer has elsewhere shown that ants fill an important place in the economy of nature by contributing to the fertilization of the earth. In the paper referred to it appears, from measurement of the amount of soil actually excavated, that, insignificant in size as these insects are, the labors of countless hosts through many years are by no means insignificant in the shifting of the soil. They pulverize the ground and bring it in great quantities to the surface, thus making good top soil for the growth of vegetation. In addition to this, the ants bring about the aëration of the soil, so needful for its productiveness. Moreover, the system of "pores" established by the galleries which everywhere perforate the ground affords, on the one hand, free entrance for the rains into the earth, and on the other hand a series of tubes through which, by capillary attraction, the moisture may ascend to the roots of the plants. The last work of Dr. Charles Darwin is devoted largely to similar habits on the part of the earth-worm; and in view of the interest which that subject has elicited, one may venture to call attention again to the distinguished service wrought for the benefit of agriculture by the industrious ant. Even if that insect should not be as tractable for domestication as her hymenopterous ally the bee, and in spite of her occasional forays upon our cupboards and crops, the ant is worthy to stand at the head of insects beneficial to man. This conclusion is strengthened by the service which she renders as a scavenger in the great and complicated system by which Nature's "board of health" purifies the earth of dead matter. (See § II., "FOOD AND FEEDING HABITS.")

§ IX. GEOGRAPHICAL DISTRIBUTION.

Some of our ant species are widely distributed, and some have been probably imported. That universal pest of the housekeeper, the little red ant, *Monomorium pharaonis*, is probably a foreigner; at all events, it is a cosmopolite, being found in houses all over the world. Mr. Frederick Smith had reason to believe that it is a native of Brazil, whence it has been distributed in merchandise. *Formica rufa* of the Rocky Mountains, and *F. exsectoïdes* of the Alleghanies, differ little from the European *F. rufa* and *F. exsecta*. *F. sanguinea*, the red slave-maker, is common to both continents, and our shining slave-maker, *Polyergus lucidus*, differs very little from the European *P. rufescens*. The pavement ant, *Tetramorium cæspitum*, inhabits both hemispheres. *Pheidole megacephala*, found in the neighborhood of Philadelphia, is distributed throughout the tropical and sub-tropical regions of the entire world. *Lasius flavus* is substantially the same species here and in Europe.

Some of our indigenous species have a remarkable elasticity of organism by which they are adapted to the widely varying climatic and geographical conditions of our country. For example, both the red and shining slave-makers which inhabit the Atlantic coast are found in the Garden of the Gods, Col. Several species of the carpenter ants are distributed throughout our forests from Maine to California, notably *Camponotus pennsylvanicus*, which is found not only in our Eastern mountains, but in sub-tropical Texas. Prof. Aug. Forel has examined specimens from New Orleans and California, as well as from China, Japan, and Siberia. Throughout all these regions it has precisely the same habits as described by the writer. *Formica fusca*, which so often appears as a domestic ally or "slave" of the kidnapping species, is widely distributed over our continent, and is substantially identical with the species of the same name found nearly everywhere in Europe. On the other hand, some ants have well-marked geographical limits which have not yet been overcome by natural movements. The occident ant (*Pogonomyrmex occidentalis*) has been traced approximately within a range of 13° of latitude, say from 45° N. to 32° N., and of 21° of longitude; that is, from Brookville, Kan., to Reno, at the base of the Sierra Nevada, 1622 miles west of the Mississippi River. So also the cutting ants, fortunately for agriculturists, are even more sharply limited to the South-west. Within the same geographical province, but with a little more elastic margin, the honey ants are confined. If we exclude the lower Gulf States and the South-western States and Territories, the ant-fauna of the United States corresponds very closely in genera, and even in the principal species, with that of Europe, a fact of some importance in determining the great zoological districts of the earth.

§ X. CLASSIFICATION AND BIBLIOGRAPHY.

Ants belong to the order *Insecta*, or true insects, sub-order *Hymenoptera*, section *Formicariæ*. Both from their habits and structure they are placed with the true fossorial *Hymenoptera*, and are closely related to the *Mutillæ*, wasps and bees. They are divided (André) into four family groups—(I.) *Formicidæ*, (II.) *Poneridæ*, (III.) *Dorylidæ*, and (IV.) *Myrmicidæ*. Forel has another, which he makes the second sub-family—viz., *Dolichoderidæ*. The ants most popularly known and most numerously represented in the fauna of all countries belong to the *Formicidæ* and *Myrmicidæ*. The principal characteristics of these two are therefore given:

- I. **FORMICIDÆ.** Petiole with a single joint, usually surmounted by a scale of various form and thickness; sometimes with a spherical or cubical node. The workers with or without ocelli. Abdomen not contracted between the first and second segments. The sting is wanting, or is only rudimentary. Pupæ sometimes naked, sometimes enclosed in a cocoon.
- IV. **MYRMICIDÆ.** Petiole composed of two joints, for the most part nodiform. Workers without ocelli, or at the most with the faintest traces of those organs in isolated individuals. Abdomen not contracted between the first and second segments. With the workers and females the sting is generally well, often acutely, developed, rarely rudimentary. The pupæ are always naked.

To the *Formicidæ* belong such well-known species as the mound-making ant (*Formica exsectoïdes*), the red slave-maker (*Formica sanguinea*), the shining slave-maker (*Polyergus lucidus*), the carpenter ants (*Camponotus pennsylvanicus*, etc.), the brown garden-walk or meadow ant (*Lasius flavus*), the honey ant (*Myrmecocystus melliger*), the slave or *fuscous* ant (*Formica fusca*). The most common genera are probably *Formica*, *Camponotus*, and *Lasius*.

To the *Myrmicidæ* belong such well-known species as the agricultural ant, occident ant, and Florida harvester (*Pogonomyrmex barbatus*, *occidentalis*, and *crudelis*), the little red house-ant (*Monomorium pharaonis*), the turn-tail ant or turn-belly (*Crematogaster lineolata*), the pavement ant (*Tetramorium cæspitum*), our numerous species of *Aphænogaster*, and the common big-head ants (*Pheidole pennsylvanica*).

The family *Poneridæ* may be easily recognized by the constriction on the anterior part of the abdomen, decidedly dividing it into two parts.

It is not within the province of this article to enter at length into the classification of the ants, but students will find the following works valuable: (1) *Species des Formicides d'Europe*, by M. Ernest André; (2) *Les Fourmis de la Suisse* and *Études Myrmécologiques*, by Dr. Auguste Forel; (3) *Catalogue des Formicides d'Europe*, by Emory and Forel; (4) the various papers (extremely valuable to the reader of German) of Dr. Gustavus Mayr; (5) *List of Hymenoptera in the British Museum*, "Formicidæ," by the late Frederick Smith. In the works of Forel and André a good bibliography will also be found. The American student will probably find Nos. 1 and 5 of the above most useful in determining indigenous fauna. Very little has been done toward arranging the American ants, although the field is one of the most inviting and important within the reach of the entomologist. The most considerable contributions are by Mr. E. Norton and Mr. S. B. Buckley in *Proceedings American Entomological Society of Philadelphia*, 1866–67, "Descriptions of New Species of North American Formicidæ." A short descriptive paper by the writer is published in the "Report on the Cotton-worm" by the U. S. Agricultural Department, 1879, including the following species: viz., *Dorymyrmex insanus*, *D. flavus*, *Iridomyrmex Macooki*, *Crematogaster lineolata*, *C. clara*, *Solenopsis xyloni*, *Monomorium carbonarium*, with some figures. The habits and structure of some of our species have been more extensively studied (by the present writer chiefly) and published in various books and papers. Some of the earliest descriptions were by Say; and Cresson, Walsh, and Flint have added a few. Among foreign students, Mayr, Roger, Olivier, Forel, and Smith have added to our knowledge of American species. The principal books are—*The Agricultural Ant of Texas* and *The Honey and Occident Ants* (J. B. Lippincott & Co., Philada.). In the last-named book a list and brief abstract of the author's various papers will be found, from which the student can obtain some idea of the amount and value of work done in myrmecology among American species. (H. C. McC.)

[NOTE.—The foregoing article treating of the general habits and characteristics of ANTS, there are two species whose economy, recently studied and elucidated, is of such importance in natural history as to warrant separate treatment. See article following.]

HARVESTING AND HONEY ANTS.

The name of *harvesting ants* is given to certain species found in the semi-tropics and the southern regions of the north temperate zone. They have been observed particularly by Moggridge in the south of France, by McCook in Texas, and by Mrs. Treat in Florida, and are found to display a combination of foresight and intelligence. The title "harvesting" is applicable, since these ants gather carefully the ripe seeds of certain grasses and store them in granaries in their underground nests, presumably for use as winter food. They are spoken of by many of the ancient authors, and the stores of grain which they gather in Palestine appear to be so considerable that there is a precept in the Talmud to settle the question of ownership of the grain found in ants' nests. Some travellers, in fact, speak of a *bushel* of grain as quickly disappearing by the efforts of these active harvesters, and Bates describes South American ants who carry off as much as two bushels of mandioca in a night. In times of famine in India the natives rifle the ants' nests for food.

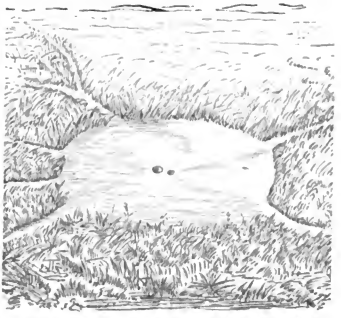


FIG. 1.—Disk Nest of Agricultural Ant, with roads.

The agricultural ant of Texas (*Pogonomyrmex barbatus*) is the harvester with whose habits we are best acquainted through the close and careful observations of Dr. McCook; and among the most interesting of these habits is that of making a wide circular clearing around the nest, in which only a special kind of grass is permitted to grow. Lincecum goes further, and declares that the ants even sow the seed for this special crop; but McCook was able to discover no trace of such an intelligent habit. It is certain, however, that they harvest the ripe seed, store it up in granaries in their nests, and then remove the dry stubble from the field, leaving it bare for the next year's crop. But they also gather grain from regions beyond their cultivated field, and for this purpose make long roads which branch in every direction through the surrounding forest of grass.

These roads are broad at first, but gradually narrow until they disappear. They are kept clean and level, and on them may constantly be seen lines of ants going for or bringing in the grain from the more distant harvest-fields of ripe grasses. Such cleared fields and radiating roads have not been observed outside of Texas, except in a nest of Indian ants described by Dr. Jerdon. The nests of the harvesting ants are in several stories, and contain numerous passages, rooms, and granaries, the roofs of the latter being supported by pillars. If the seeds stored in the nests of the Texas ants become wet and sprout, they are carefully carried out and left to dry in the sun, and only those which have not sprouted are carried back into the nest. In India, on the contrary, much of the grain is carried up *before* the rains and left to be devoured by birds. Moggridge suggests that this is done to prevent the passages becoming choked up by sprouting and swelling grain. He also states of the Mediterranean ants that if the seed begins to sprout, the radicle or fibril is at once destroyed. Dr. McCook found the granaries at various depths, from an inch or two to two and a half feet, beneath the surface. As to the consumption of this food, it was formerly believed by entomologists that ants were incapable of eating anything hard. Moggridge and Mrs. Treat believe that the grain is not eaten until it has germinated, and McCook also thinks it may be allowed to swell so as to split its hard outer covering, though he found no satisfactory evidence of this. In eating, the seed is held by the fore feet, and the juices and minute particles slowly pressed out by the tongue, used like that of a dog or cat in lapping or licking. This is perhaps aided by the secretion of the salivary glands, which are six in number. On the whole, the habits of the harvesting ants display a remarkable intelligence for such minute creatures. (For fuller particulars see *The Agricultural Ant of Texas*, by H. C. McCook, and *Harvesting Ants and Trapdoor Spiders*, by Mr. Moggridge.)

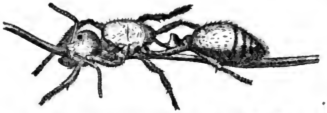


Fig. 2.—Agricultural Ant carrying a grass stalk.

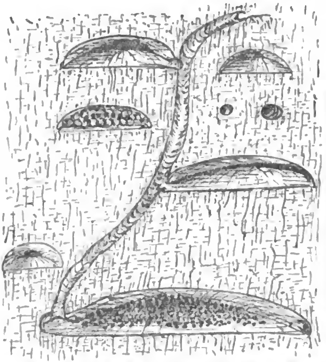


Fig. 3.—Vertical section of Occident ant-nest. Seed- and store-rooms.

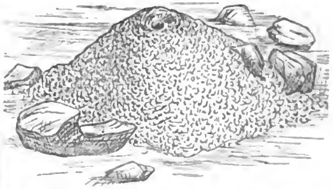


Fig. 4.—Nest of Honey Ant, "Garden of the Gods."

Honey ant is the name given to *Myrmecocystus melliger*, a species of ants extending from Southern Mexico as far north as Colorado, and remarkable for its habits and the extraordinary structural change of certain members of the nest. These ants, as observed by Dr. H. C. McCook in the "Garden of the Gods," Colorado, make large mounded nests in the hard gravelly ridges of that locality. They are nocturnal in habit, and their food consists of honey, which exudes from galls on the scrub-oak, which grows there plentifully.

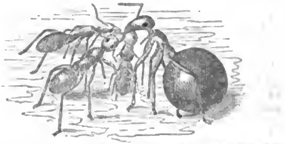


Fig. 5.—Honey-bearer feeding workers by regurgitation.

The ants work all night long, gathering this sweet exudation, which they do not use immediately as food, but store up in a very singular manner. It is not saved in any manner analogous to that adopted by the bee, but certain of the ants are actually converted into living honeycombs in the following way: The abdomen of an ant is walled by ten movable plates, underlaid by an elastic membrane; hence it is capable of great expansion. The abdominal intestine contains a sac-like cavity called the crop, anterior to the stomach. This crop is very distensible, but can be readily contracted by the aid of surrounding muscles. The honey with which the crop of the prospecting ant is filled is

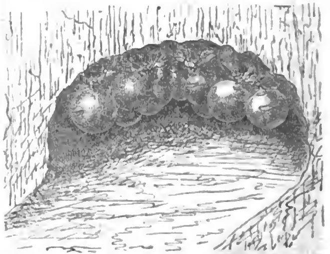


Fig. 6.—Interior of honey-rooms; honey-bearers hanging to roof.

forced, by muscular contraction, from its mouth into that of one of the *honey-bearers*. This method of storage is continued until the crop and the abdomen of the latter become extraordinarily distended, and the ant resembles a round sac of amber-colored honey of the size of a large pea, with the head and thorax like small appendages on one side. There is no more remarkable phenomenon in the whole range of animal life. By the enormous distension of the crop the remaining organs of the abdomen are compressed against its walls, so as to seem almost obliterated, the stomach being so flattened that it is difficult to perceive how it can retain its function. The *honey-bearers* are rendered almost helpless by this change of condition, but are carefully attended to by the other ants. They are kept in certain apartments, to whose roofs they cling, their overweighted abdomens hanging downward like amber globes. When a honey-room was opened by the observer the ants could be seen actively dragging off their helpless food-bearers, even hauling them up perpendicular ascents. The honey laid up in this peculiar manner is undoubtedly used as a store of food for some or all of the members of the nest. The ants needing food apply their mouths to that of the honey-bearer, when a slight contraction of the muscles surrounding the crop of the latter forces out minute drops of the honey, which gathers upon the organs around the mouth and is licked off by the hungry ants. This is probably the only instance in nature in which a living creature is converted into a depository of food for the use of its fellows. Honey ants are used by the natives of New Mexico as desserts to their feasts. A plate of the ants is placed upon the table, and the honey extracted by a pressure of the distended sac between the teeth. (C. M.)

APACHES, an Indian tribe of the Athabascan family who are widely separated from the other members of the family, and roam from Texas to Arizona in the United States and over the northern states of Mexico. They are closely connected in language with the Lipans and Navajos of the same region, but differ from them in degree of advancement. The Apaches are, in fact, among the fiercest, most nomadic, and least cultivated of Indians. They select no regular chiefs, know nothing of the arts of agriculture and manufacture, and devote their whole lives to war, theft, and treachery. They are excellent horsemen, are very skilful in the use of firearms, and have long been a terrible scourge to Northern Mexico. Every effort to civilize or convert them to Christianity has failed, and their bitter hostility to the whites has never been appeased.

The Apaches are divided into several bands, named the Gila, the Tonto, the Mescalero, and the Coppermine Apaches—the Jicarillas, the Mimbreños, the Pinaleños, the Coyoteros, the Llaneros, and some smaller parties. A part of the so-called Tonto Apaches are of the Yuma stock, and are by no means true Apaches. These bands used to roam widely over the broad and partly desert plains and the mountain-regions of the district above named, seeking every opportunity to massacre emigrants or to ravage and destroy border settlements. From an early period they have been a scourge to the districts of Northern Mexico, and it is stated that up to 1762 no less than 174 towns, missions, and estates had been depopulated in Sonora alone. They are said to have made a district twice as large as California uninhabitable; to have utterly ruined large and flourishing towns which once contained several thousand inhabitants; to have made deserts of great ranches stocked with thousands of cattle; to have destroyed numerous villages; and, in short, to have made a tenantless desolation of a belt of land 500 miles long and from 30 to 80 wide. Thousands of lives were destroyed, often with fearful torture, thousands of women and children taken captive, and all of Northern Chihuahua and Sonora, large regions of Durango and New Mexico, and the whole of Arizona, laid waste by these ruthless and treacherous savages.

This was largely the work of one man, their celebrated leader, Mangas Colorado, who for fifty years was the great war-chief of the Apaches and consolidated their separate bands into a powerful confederacy. Of the able Indian leaders who have from time to time arisen, this man ranks among the first. His native shrewdness and knowledge of human nature enabled him to control the fierce Apaches, who had yielded to no other chief; to combine the wandering bands; to quell their disputes and jealousies; and during his long life to make them one people, ruled by one mind and devoted to one object—that of the slaughter of the whites. No Indian chief ever inspired as much terror or has an equal record for bloodshed, cruelty, and treachery, since his leadership of the Apaches continued for a full half century, and principally to him is to be ascribed the desolation of Mexican territory above described. He was finally captured by United States troops in 1863, and shot while attempting to escape.

Since the United States acquired the Apache territory the savages have given great trouble, though they have found in the American miners foes of very different character from the timid Mexican settlers. They appear to dread the Americans, and their raids on United States territory have been much fewer than upon the Mexican provinces. Efforts have been made of late years to place the Apaches upon reservations, and some success has been achieved. These efforts were opposed by the frontier Mexicans and Americans, who had so long and severely suffered from the savages, and were full of revengeful bitterness against them. A reservation was made at Camp Grant, in Arizona, in 1871, which, according to the evidence, proved but a resting-place for the Apaches between their raids, no proper watch being kept over them. In consequence, many depredations and outrages were committed, and the infuriated inhabitants fell upon the Indian camp, consisting of more than 100 Apaches, massacred all the men and women, and carried off the children as prisoners. The Apache reservations are now more closely guarded.

Since this massacre the Apaches have given much trouble, and of late years, under the leadership of a chief called Victoria, have committed many murders and depredations. The raids of this chief continued for more than a year and a half, and over 400 persons were murdered. Finally, in 1880, a determined pursuit was made of his band by American troops. Many of the Indians were killed, and the remainder were pursued 100 miles into Mexican territory. Here they were attacked by Mexican troops, and so severely dealt with that their leader was killed and but 30 of them escaped to regain their old haunts. Most of the Apaches are now on reservations in New Mexico, Arizona, and the Indian Territory, yet several bands of them are still at large. In 1882 a raiding-party was punished by the Mexicans; in 1883, Gen. Crook captured a party on Mexican soil. The Apaches are of slight build, but agile, and are thorough adepts in the art of concealment. They fight more like assassins and murderers than warriors, attack only when sure of success, and will lie in ambush for days when seeking an opportunity for robbery or murder. They are of low stature and ugly features, with something of a Mongolian cast. Their feet are remarkably small, a circumstance which renders an Apache trail easily distinguishable from that of other Indians. They dwell in very light, frail lodges made of poles and covered with brush, skins, or bark. One marked feature among them is the great chastity of their women. The girls are allowed free choice of a husband, and must be wooed and won. The swain ties his horse near the lodge of his desired bride. If she feeds and waters it within four days, he is accepted; if not, he is rejected. Acceptance is followed by the purchase of the bride from her parents, a certain number of horses being given according to her value in the eyes of her lover. Polygamy is permitted and divorce is very easy.

In fighting, the Apaches formerly used long, iron-pointed arrows, but these are now largely replaced by firearms, in the use of which they are very expert. They ride small, tough ponies, which they keep in rapid motion during a fight. The women take part in their raids, and are as good riders and as savage as the men. They do not scalp their victims. In the art of signalling they are very expert, and will tell the whole fortune of an expedition by the different methods of arranging stones upon their trail.

They believe in immortality and in the existence of a good and an evil deity of equal power, though the good will finally prevail. Few religious ceremonies are practised. Their language is a difficult one, guttural and hissing in sound and indistinct in intonation. The estimates of the numbers of the Apaches have been very vague, and vary from 7500 to 25,000. (C. M.)

APATITE is the name given by Werner to a mineral species formerly classed by mineralogists together with a number of other species resembling it in shape and color. The name is from ἀπατάω, "I deceive," in allusion to the above fact. It is found usually in well-defined crystals belonging to the hexagonal or rhombohedral system of crystallization. The common form is that of a six-sided prism terminated at either end by a plane at right angles to the sides of the prism—the basal plane. The edges produced by this combination appear regularly bevelled by one or more faces. These bevels are due to one or more six-sided pyramids, as also the truncations of the corners to pyramids of the second order. Oblique bevels at the corners are due to one or more scalenohedrons, which, however, are not often found. Sometimes crystals are developed largely in the basal plane, with a suppression of the prism; they then appear as six-sided plates. But a tabular form may be produced also by the over-development of two opposite sides of the prism; they appear then as rectangular plates with bevelled edges. To identify the crystals in this case it becomes necessary to measure the angles. These are invariable: no matter how much the planes may grow or decrease, the prismatic angles will always measure 120°.

The changes of form just described are common to all minerals crystallizing in hexagonal symmetry, and other tests must be employed to distinguish them from apatite. Beryl, aquamarine, and emeralds are different colored varieties of a mineral which in form and color greatly simulates apatite, and with which even mineralogists formerly confounded it, although in chemical composition they have nothing in common. The two species are often found on the same piece of rock; the one is a gem, the other not fit for use as such. Besides a peculiar difference in lustre, that of beryl being strongly glassy, that of apatite generally greasy—*i. e.*, lard-like—there is a difference in hardness by which they can be distinguished easily. A sharp splinter of quartz or rock-crystal, usually found in the same piece of rock, or, in default, a sharp point of hard steel, will easily produce a scratch on apatite, but will make no impression on beryl. Crystals of apatite are often very large; prisms several feet long and over one foot thick have been found; in this respect also it resembles beryl. Usually, crystals are small in granite and gneissic rocks, and large in limestone.

In chemical composition apatite is a saturated calcium phosphate in molecular combination with calcium chloride and calcium fluoride, so that three molecules of the former are combined with one molecule of the latter, $3\,(Ca_3P_2O_8) + Ca\left\{\begin{matrix}Cl\\F\end{matrix}\right\}_2$. Generally, the fluorine greatly exceeds the chlorine. For this fluor-apatite the formula requires the percentage composition, phosphoric anhydrite $(P_2O_5) = 42{\cdot}26$; calcium oxide $(CaO) = 55{\cdot}56$; fluorine $(F) = 3{\cdot}77$; with which theoretical composition most of the published analyses closely correspond. To test a suspected specimen, pulverize about two grains until the powder is impalpably fine. Shape one end of a platinum wire into a loop; dip this into concentrated commercial oil of vitriol, and then into the powder; then hold it in the colorless point of a strong blowpipe flame. If the flame now assumes a pale bluish-green color, it proves the presence of a phosphate. Put the rest of the powder on a clean watch-glass; mix it with a few drops of oil of vitriol; if a very pungent, corrosive smell is perceived, this denotes the evolution of hydrochloride acid gas or hydrofluoric acid gas; and if, after cleaning and drying, the glass shows a dull spot where the mixture was, the presence of fluorine in the specimen is established.

Pure apatite is colorless; crystals have been found of watery transparence, but these are rare. Commonly, the mineral shows decided color—bluish-green, yellowish-green, yellow, brown, and brick-red, violet-blue, and milky-white. The colors are accidental; that is, they are produced by mechanical admixture of substances foreign to the apatite substance itself. Chemistry has thus far isolated the coloring elements in the opaque brown and red varieties. Here it consists of minute microscopic crystals of red hæmatite (oxide of iron). In the opaque green apatite the color is produced by numerous imbedded scales of chlorite or ripidolite. The blue, violet, yellow, and transparent green colors are probably due to organic compounds derived from bitumen or natural tar. The colors are destroyed when the mineral is heated for some time to red heat in presence of air.

While it is quite easy to identify the mineral apatite when it is found in well-formed crystals, it requires the application of chemical tests, as above described, to identify its micro- and crypto-crystalline varieties, which we designate as fibrous, massive, compact, and earthy. The fibrous apatite occurs in uneven concentric layers with convex surface, as at Crown Point on Lake Champlain. This variety when heated emits a peculiar green phosphorescence. The massive varieties are generally granular, white and amethystine in color, resembling granular limestone or fluor-spar. To these varieties commercially the name *phosphorite* is applied. The white earthy varieties are called *osteolite* (Gr. ὀστέον, a bone).

Next to rock-salt, there is no other mineral substance so important to the economy of organic life as apatite. No vertebrate animal can exist without it, for the mineral part of its bones consists of apatite to the extent of 75 per cent. Whether the phosphates are such an important factor in the nutrition of nerve-substance and the brain as centres of nervous activity, as has been claimed by many physiologists, remains an unsettled question. The mineral apatite is practically insoluble in water. It is dissolved by all acids, even the least active ones, when in a very finely divided state; crystals are very slowly dissolved. Apatite is found in all rocks at the surface of the earth, in some more than in others. By disintegration the former make rich soils, the latter poor ones. From its rootlets the plant secretes an acid liquid, through whose agency the otherwise insoluble apatite becomes soluble, and is absorbed by capillary action into the stem and all its ramifications, leaves, flowers, and seeds. The stem retains little; the bulk remains in the leaves and seeds. These latter are eaten chiefly by herbivorous animals and by man. They store it up in their bony skeletons, whose strength it makes, whilst little leaves the body in its secretions. To the fields whence the living animals have drawn their food the skeletons must be returned in order to restore the source of fertility. But even if all the skeletons were returned, much has been wasted in this astonishing series of rotation—not wasted for the earth as a whole, but for the respective localities. It must be made up from other sources. This has been the outcome of agricultural chemistry, as a law against which neither individual nor nation may sin with impunity. The question of permanent prosperity, of abundance of food, finally resolves itself into the economical maintenance of a balance between exported and imported calcium phosphate, apatite, or phosphorite. It is evident that man can draw only upon Nature's accumulations to make up the deficiency. It becomes the imperative duty of geology to find the most available deposits; of chemistry, to bring the material into the most suitable form previous to returning it into the fields. This form is the **SUPERPHOSPHATE**, to which the reader is referred.

Whilst unable to point out each special deposit, geologists have determined the oldest and hence deepest rock-formation—the Archæan or Eozoic rock-system—as the chief repository of apatite. As grand geological islands this system appears at the earth's surface, the greatest portion of dry land being covered to more or less depth by the younger formations of slates, sandstones, and fossiliferous limestones. From its extensive outcrop in the valley of the St. Lawrence and the lakes, geologists speak of the lower series, composed chiefly of granite, gneiss, and mica-schist, as the *Laurentian* system, and of the upper series, composed of quartz-schists, pyroxenic-hyperstenic rocks, serpentine, and crystalline white limestone, as the *Huronian* system. In all these rocks we find apatite as an accessory mineral; so in the magnetic iron-ore deposits of Essex co., N. Y., and throughout the belt on the eastern flank of the Appalachian mountains from Canada to Georgia; but the *accumulations* of apatite are confined to the Huronian rocks, and particularly to the white crystalline limestone. In Pennsylvania, in New Jersey, and in New York this limestone is quite rich in apatite, but no deposits of commercial importance thus far have been found except those of Canada. Here, in the province of Quebec, the Huronian system covers a very large area, forming a very rugged surface in a system of hills following generally a direction north-east to south-west, and corresponding on the whole to the foldings and plications of the rocky strata. From the city of Kingston, on Lake Ontario, past the city of Perth, the apatite belt has been traced across the great Ottawa River, near the town of Ottawa itself; thence between the Gatineau and Du Lièvre rivers northward, on a straight line 130 to 140 miles in length. This extensive outcrop appears concentrated in the south of Perth upon an area which comprises the townships of North and South Elmsley, North and South Burgess, North and South Crosby, Bedford, and Loughboro'. Here the earliest discovery was made about the year 1850 by Dr. Wilson of Perth, the specimens being identified and their nature explained by Dr. T. Sterry Hunt, then of the Geological Survey of Canada. Since that time this section has been constantly worked, more or less successfully. Much more recently the north-eastern section of the fields has come into notice. It has been explored from the Ottawa River to between 70 and 80 miles north by east within the townships of Hull, Templeton, Buckingham, Portland, Wakefield, Masham, Low, Denholm, Bowman, Bigelow, Hinks, Aylwin, Wright, Northfield, Blake, Bouchette, Cameron, Wabasse, and is known to exist over a number of others still farther to the north which have not yet been critically examined. This part of the field, which is properly known as the "Gatineau" section, has been worked since 1871 in the township of Buckingham, where the Buckingham Mining Co. operates the deepest working, not 100 feet yet, and ships apatite "ore" of excellent quality. Quite recently an increased activity of capital has manifested itself to exploit this section. Amongst a number of others, the American Phosphate and Land Co. of Philadelphia may be mentioned, which is now working a lot of 400 acres in Templeton township. Here, near the crest of a hill, a most remarkable outcrop has been exposed by stripping the surface. An excavation 30 by 50 feet has been sunk in solid apatite, which is of greenish color. The top rock, a massive greenish-black pyroxene, has been removed a distance of 50 feet towards the hilltop, and nothing but apatite exposed. In view of such surface-showings, and in view of the national importance of the subject and of the capital which may be induced to engage in the enterprise, it becomes interesting to inquire what geology may have to say regarding the origin, the distribution, and the probable extension in depth of these deposits. Unfortunately for this inquiry, the mining-work thus far, especially in the Perth district, appears to have been done by non-professionals. Nothing has appeared in literature approaching to a mining record, such as the geologist needs as points of fact in regard to association of the minerals, the exact conditions of the enclosing rocks, and many similar data which capable mining engineers collect for their own guidance and for the advancement of geologic science. Aside from casual short visits, properly qualified men do not seem to have devoted any necessary portion of time to the study of this region. Nothing remains, then, but to treat the apatite deposits from analogy with other ores occurring in the Laurentian rock-system. None have been worked so extensively as the iron ores; in a lesser degree, the gold-bearing series of Virginia, the Carolinas, and Georgia.

As to iron ores, we have in mind the magnetic ores of New Jersey and New York. Those of New Jersey have been worked most extensively. In Morris county, along the eastern flank of South Mountain, the typical Laurentian gneiss crops out in very steeply-inclined beds or strata. It contains magnetite everywhere, but in one bed, in which the usual component of the rock, the mica, is largely replaced by black and green hornblende, the magnetite appears massed together. In some places, crowding out all the other minerals, it constitutes the bed alone; then gradually the quartz, hornblende, and feldspar reappear; the ore grows poorer and poorer, insensibly almost, until the regular gneiss fills the bed. Never very thick, and thus tapering off in length and depth, the ore-bodies present very irregular, flat ellipsoids—not *pockets*, strictly speaking, but masses of very varying size. It clearly follows that there is neither increase nor decrease, on the whole, as depth is gained. One mine, having begun work upon a solid outcrop, found it grow poorer; another, beginning on lean ore, came in richer going down, but always in alternation. At the writer's visit the Mt. Hope shaft was hoisting solid, cleavable magnetite from a depth of 600 feet, while other mines, only a quarter of a mile away, had given up at 200 feet, because the ore was too poor on the same bed. Let it be understood that the bed is *not iron ore*, but gneiss, which continues undoubtedly to greater depth than mining operations can ever reach. The iron ore is merely accessory in this gneiss.

Now, herein lies the similarity with our apatite deposits, that the crystalline white limestone forms the beds, as the hornblende gneiss above; and it appears from all the outcrops on the hills and in the water-courses, from 500 to 700 feet deeper, that this limestone, together with the gneissic and pyroxenic rock, forms very steeply-inclined beds; hence analogy declares that mining operations will not reach to the end of the limestone in depth. In it lies the apatite as an accessory, massed together in one place, and then diminishing to a few crystals or grains gradually. Evidently, this has been the experience in the southern fields, and if Nature be not inconsistent it will prove the same in the northern section. Exactly of the same nature is the occurrence of tin ore in Saxony and Bohemia, where it has been worked successfully for several centuries. There is nothing in this fact to deter enterprise, as many would think. The same vicissitudes await the miner in the finest of so-called "true fissure-veins." It is against the laws of Nature that any large and deep fissure should have been equally filled throughout with that which men covet. It never has been, and never will be. There is this difference only: a regular, well-defined deposit can be worked with less expenditure of thought and skill. The mining of apatite, as of all similar deposits, requires well-educated intelligence, and this will oppose any wasteful outlay of capital in heavy stationary machinery, where common sense will show the necessity of removal to another spot before amortization of the capital can be effected. It will oppose the organization of very large corporations with a vast capital, upon which no dividends can be realized. But for sober, intelligent work there seems no better field.

In regard to the origin of the apatite deposits, as well as all others where the mineral appears as an accessory constituent of rock, it is safe to presume that they are coexistent with the rock-formation itself. In what form the apatite pre-existed in the strata it is impossible for science to realize, but it crystallized certainly at the same time as the limestone in which it is found. It is quite useless and unscientific to speculate any further in this direction. This seems as certain as that the delicate needles of rutile enclosed in quartz crystals crystallized from the same solution as the quartz itself. Our limits forbid us to give all the chemical reasons in support of this view. There is still a notion lingering among the "practical" men that such mineralizations are due to intrusion from below—to some sort of volcanic action. Now, it is very true that apatite forms a regular part of volcanic lavas, but its being enclosed in huge masses of limestone, which cannot have been exposed to a melting heat without becoming caustic lime, all experiments to the contrary notwithstanding, is more than ample proof of its crystallization from watery solutions in Archæan times. The intrusion theory—it is a remnant of geology's childhood in its general application—is true for a very small number of ore-deposits only, and all of them much younger in geologic age than these apatite strata. (O. A. K.)

APHRIZINÆ (Gr. ἀφρός, foam; ζάω, I live), a subfamily of wading birds, coming between the plovers (*Charadriinæ*) and turnstones (*Strepsilainæ*); nearest the latter. It consists of the single genus and species *Aphriza virgata*, or surf-bird, extensively dispersed over the coasts and islands of the Pacific Ocean, occurring along the whole west coast of North America. The bird is about ten inches long, and has the general appearance and habits of a sandpiper. (E. C.)

APLODONTIA, or **Aplodontidæ**. See **Haplodontidæ**.

APPALACHEE INDIANS, a formerly powerful tribe of the Choctaw family who resided in West Florida, on Appalachee Bay. They fought with the Spanish colonists down to 1638, when they were converted by the missionaries and many of their chiefs taught to read and write. In 1687 they rebelled against Spanish oppression, but were speedily reduced. In 1702 the English and the Creek Indians invaded their country, destroyed their towns, and killed or carried off many of their inhabitants. In 1704 St. Marks was taken and the missionaries killed. Their numbers became so reduced by these various causes that early in the eighteenth century they ceased to exist as a distinct tribe, their small remnant being probably absorbed by the Choctaws.

APPALACHIAN INDIANS, a name which is sometimes applied to a linguistic family of North American Indians embracing most of the tribes of the Southern United States. The term includes the Creeks or Muskogees, the Hitchitees, Choctaws, Chickasaws, Seminoles, Coosades, Alabamas, Appalachees, and some other tribes. The Natchez of the lower Mississippi, the Catawbas of South Carolina, and the intermediate Cherokees had languages of different origin from those of the above-named tribes. But in general habits and in degree of civilization they were closely similar. The interesting, but long extinct, Timucua tribe seems to have belonged to this family. The late L. H. Morgan regarded the Appalachians as being remotely connected with the Dakota tribes.

The area of the Appalachian tribes comprised a large part of the territory east of Louisiana and south of the southern border of the Algonkins. They were, when first discovered, much in advance of the northern Indians in civilization, standing intermediate between the latter and the Mexican tribes. Agriculture was their principal occupation, maize being their chief article of food. Some of the Spanish explorers speak of passing through continuous fields of corn three leagues in extent. This was carefully gathered and stored in granaries for winter use.

They erected temples, and houses of some pretensions for the chiefs, though the common people dwelt in mean huts. Their towns, often very populous, were built in a circular form and stockaded for defence. Many mechanical industries were practised. The art of pottery had made much more progress than with the northern Indians; skins were neatly dressed for clothing; the art of weaving was partially understood; mantles of rich feather-work were made; implements of stone, bone, and wood were skilfully wrought; and many other arts were diligently pursued.

There was no division of landed property. Each community had its common plantation, of which every citizen was free to cultivate a portion for his own use. But a fixed share of the products of the fields was stored in common granaries for the benefit of all in case their private stores should fail. Each town was governed by its head-man, the *mico*, the supreme magistrate, to whom the greatest respect was paid, and who is credited by some authors with almost despotic authority. He was subject, however, to the decision of the council of lower chiefs. Next beneath him was the great war-chief, the leader of the tribe in battle. There was, moreover, a high priest, who possessed great influence. A supreme Spirit was worshipped, beneath whom the sun was venerated as a symbol of the power and beneficence of the Great Spirit. Fire was also venerated for the same reason. They believed in the immortality of the soul and in a future state of rewards and punishments.

In character the Appalachians had all the courage, craft, and stoicism of the northern tribes. They were fond of hunting and of war, and were brave and skilful warriors. In person they were tall, erect, moderately robust, and well-formed, with regular features, open expression, and dignified manner. Among the Creeks, while many of the men are over six feet high and few under five feet ten inches, the women are seldom above five feet, and most of them do not reach that height. Their hands and feet resemble those of a European girl of nine or ten. Yet they are well-formed and usually handsome and graceful.

The Appalachian languages are destitute of many of the consonants used in European tongues. The grammar of the Creek language has been treated by H. F. Buckner (Marion, Ala., 1860). This work is analyzed in Brinton's *Contributions to a Grammar of the Muskokee* (Philadelphia, 1870). (C. M.)

See Vol. II. p. 182 Am. ed. (p. 208 Edin. ed.).

APPEAL. Appeal is defined to be the removal of a cause from a court of inferior to one of superior jurisdiction for the purpose of obtaining a review and re-trial. It is derived through chancery from the civil law, and, technically speaking, is quite distinct from the remedy by writ of error, as an appeal brings up the whole case both as to law and fact for revisal, as if it had not been tried before, while the latter, which is of common-law origin, calls for a reversal of judgment only should legal errors appear to have been committed on the trial. Both are essentially, however, but different modes of attaining the same general object, and may be conveniently treated here under one head, together with the cognate subject of the removal of causes from State to Federal courts. The distinctive features of the appeal, indeed, are not everywhere so clearly marked as formerly, having been greatly modified by statute, and assimilated to the writ of error, especially in the States governed by a code. But many of the States and the Federal courts have always preserved the distinction.

Appeals, using the term in its broadest sense, in this country naturally fall into three general divisions—those confined to the courts of a State; those from the supreme courts of the States to the Supreme Court of the United States; and those from an inferior to a superior Federal court. Taking them up in order, the rules governing appeals are numerous and varied throughout the States, but in many respects they are nearly identical, differing rather in the exact application of principles than in the principles themselves. Thus, an idea of the system in general may be obtained from glancing at the regulations on the subject of one State —*e. g.*, Pennsylvania:

Any person dissatisfied with the judgment in any action may take a writ of error or an appeal to the supreme court, upon making affidavit that the same is not intended for delay; this must be done within two years from the rendering of judgment; but in case of legal disability—*i. e.*, should infancy or lunacy prevent a person from exercising the right—the two years will begin to run from the removal of such disability. A writ of error does not stay execution in civil cases unless issued within three weeks from the time when judgment is entered and security given to prosecute the writ with effect; and the security required in taking appeal, writs of error, and *certiorari* is double the amount of costs accrued. Appeals from the orphans' courts must be taken within three years, and from the magistrates' (justices') courts to the common pleas within twenty days, upon giving security.

An appeal, or a writ of error, or of *certiorari*, taken out under the prescribed regulations, is said to act as a *supersedeas; i. e.*, until the decision is reached in the superior court the proceedings in the court below cease; in case of an execution on a judgment it is stayed. The writ of *certiorari* above referred to resembles a writ of error, and issues in most of the States from the superior to the inferior courts of record to remove proceedings, not according to common-law procedure, but as regulated by statute. Its use is often auxiliary to an appeal or writ of error, to obtain from the court below a perfect transcript or copy of the record of a case which is before the superior court on appeal. The writ of *mandamus* is also used for this purpose. Where a cause is decided to be sent back to the lower court to be proceeded with, the appropriate writ from the superior court is *procedendo* or *mandamus*.

As to the second class of cases, decisions of the State supreme courts to be reviewed by the Supreme Court of the United States, the usual distinction between matters of law and equity in carrying up the cause is not maintained. Appeals cannot be taken, and decrees in equity, as well as judgments at law, can be brought up on writ of error alone. The law governing the class of cases thus open to review is as follows:

A final judgment or decree in any suit in the highest court of a State in which a decision in the suit could be had, where is drawn in question the validity of a treaty or statute of, or an authority exercised under, the United States, and the decision is against their validity; or where is drawn in question the validity of a statute of, or an authority exercised under, any State, on the ground of their being repugnant to the Constitution, treaties, or laws of the United States, and the decision is in favor of their validity; or where any title, right, privilege, or immunity is claimed under the Constitution or any treaty or statute of, or commission held or authority exercised under, the United States, and the decision is against the title, right, privilege, or immunity specially set up or claimed by either party under such Constitution, treaty, statute, commission, or authority,—may be re-examined, and reversed or affirmed in the Supreme Court upon a writ of error. The writ shall have the same effect as if the judgment or decree complained of had been rendered or passed in a court of the United States. The Supreme Court may reverse, modify, or affirm the judgment or decree of such State court, and may, at their discretion, award execution or remand the same to the court from which it was removed by the writ.

The writ of error must be sued out within two years after judgment in the State court, with the usual exception in favor of persons under disability. The citation must be signed by the chief-justice, chancellor, or judge of the State court which rendered the judgment or decree complained of, or by a justice of the Supreme Court of the United States; and the adverse party must have at least thirty days' notice. The writ of error will be a *supersedeas* if the defendant serves it upon the adverse party within sixty days of the rendering of judgment and entering security.

All process of the Supreme Court is in the President's name, but for the convenience of suitors in all parts of the country the writ of error may be issued and filed in the clerk's office of the court whose proceedings are reviewed. The consent of parties to submit cases for review to the Supreme Court not provided for by the statute will not confer jurisdiction.

Federal Courts.—The provisions of the Revised Statutes of the United States as to appeals and writs of error involving only the Federal courts are briefly as follows: In matters exceeding $50 in value a writ of error lies from the final judgment of a district court to the circuit court of the same district. Final judgments of a circuit court in matters exceeding $5000 may be reviewed on writ of error by the Supreme Court, and the same is true of judgments of the circuit court affirming or modifying a judgment of the district court in a case of like value, but otherwise if the circuit court has reversed the judgment of the district court and ordered a new trial. In case of a difference of opinion between the two judges of a circuit court the opinion of the presiding judge is that of the court for the time being; but upon entry of final judgment the point of disagreement must be certified upon the record, and such judgment may be reviewed by the Supreme Court on writ of error. Judgments of a circuit court touching patents or copyrights, or in actions against any revenue officer for his official acts, or in any case brought on account of the deprivation of any right, privilege, or immunity secured by the Constitution, or of any right or privilege of a citizen of the United States, or in an action for injury to person or property by any act done in furtherance of any conspiracy against the Government of the United States, may be reviewed by the Supreme Court on writ of error without regard to the amount in controversy. A writ of error from the district to the circuit court must be sued out within one year, and from the circuit to the Supreme Court within two years, after the entry of judgment, except in case of disability.

Upon obtaining a writ of error, which is issued as a matter of course on application to the clerk of the circuit court, the appellee receives a citation requiring him to show cause before the appellate court on a certain day. The clerk of the inferior court makes a return to the appellate court, which includes the writ of error, the citation, an authenticated transcript of the record, including the bill of exceptions, an assignment of errors, and a prayer for the reversal of the former judgment. The plaintiff in error must enter bond with security for costs, and should he wish to stay execution he must also give security for the amount of the judgment. The appellate court has the broadest authority to affirm, modify, or reverse the judgment, or may direct such further proceedings to be taken by the inferior court as the case may require. When judgment is affirmed the court will adjudge the respondent just damages for his delay, besides his costs. The details of practice involve a number of other provisions, but these will suffice to give a general idea of the subject.

The distinction between law and equity is rigidly preserved in the United States courts, and in cases of equity and admiralty jurisdiction appeals may be taken from the district to the circuit court, and from the district and circuit courts to the Supreme Court, under the same regulations as govern writs of error. An appeal is taken by a petition addressed to the appellate court setting forth the proceedings in the court below and praying a reversal, and is allowed as a matter of course by one of the judges of the inferior court.

The subject of appeals in the Territorial courts, and from them and from the remaining inferior Federal courts, to the Supreme Court of the United States, will be found touched upon under their appropriate heads in the article on COURTS OF THE UNITED STATES.

Removal of Causes.—By this phrase must be understood something quite distinct from the carrying up of a case to a superior court on a writ of error or appeal. It refers to proceedings commenced, but not completed, in a State court, which Congress has permitted to be removed for trial or argument in a national court at the instance of defendant. Suits may also be removed from one district or circuit court to another, on motion of a party or of the court, whenever it appears that the judge of such court has been or is in any way concerned in interest in any suit pending therein, or is in any way connected with either party thereto, so as to render it improper, in his opinion, for him to sit on the trial. This right of removal is not contained in the Constitution, but is strictly the creature of Congress. Hence we must look to the acts of Congress for the cases in which the right may be exercised. Of these there have been a number, beginning with the Judiciary Act of Sept. 24, 1789, followed by those of July 13, 1866, March 2, 1867, and March 3, 1875. The last is especially important, as it has added to and enlarged the classes of cases that may be removed, and has restricted the time in which the removal may be applied for within narrower limits. Its provisions are as follows:

> Any suit of a civil nature, at law or in equity, now pending or hereafter brought in any State court, where the matter in dispute exceeds, exclusive of costs, the sum or value of $500, and arising under the Constitution or laws of the United States, or treaties made, or which shall be made, under their authority, or in which the United States shall be plaintiff or petitioner, or in which there shall be a controversy between citizens of different States, or a controversy between citizens of the same State claiming lands under grants of different States, or a controversy between citizens of a State and foreign states, citizens or subjects,—either party may remove said suit into the circuit court of the United States for the proper district. And when in any suit mentioned in this section there shall be a controversy which is wholly between citizens of different States, and which can be fully determined as between them, then either one or more of the plaintiffs or defendants actually interested in such controversy may remove said suit into the circuit court of the United States for the proper district.

The following provision of the act of March 2, 1867, has proved of great importance:

> When a suit is between a citizen of the State in which it is brought and a citizen of another State, it may be so removed on the petition of the latter, whether he be plaintiff or defendant, filed at any time before the trial or final hearing of the suit, if before or at the time of filing said petition he makes and files in said State court an affidavit stating that he has reason to believe, and does believe, that, from prejudice or local influence, he will not be able to obtain justice in such State court (Rev. Stat., § 639, sec. 3).

The proceedings for removal are taken in the State court, not in the circuit court to which the cause is to be removed, "before or at the term at which such cause could be first tried, and before the trial," and may be from any State court, provided the amount involved amounts to $500. The party desiring to avail himself of the benefits of the act files a petition in the State court setting forth, in the language of the statute, the grounds for seeking a removal; and he must, at the same time, file a bond with good and sufficient surety for entering in the circuit court, on the first day of its then next session, a copy of the record in the suit, and for paying all costs that may be awarded by the circuit court if it should hold that the suit had been improperly removed. The petition being filed and the requirements complied with in a proper case, the State court has no discretion to refuse the removal, and can proceed no further. The filing of the record gives the circuit court jurisdiction, and the cause goes on as if originally commenced in that court. Owing to the fact that the Federal courts preserve the distinction between law and equity, should a suit be brought from a State court uniting legal and equitable grounds of relief, the circuit court may order the pleadings framed anew, so as to present either a cause at law or one in equity, or two distinct causes, if necessary. (See, generally, COURTS OF THE UNITED STATES.) (A. L., JR.)

APPEARANCE, in law, a coming into court as party to a suit, generally, but not necessarily, spoken of the defendant as the formal proceeding by which he submits himself to the jurisdiction of the court. Appearance meant anciently an actual coming into court, either in person or by attorney, and traces of the old practice still appear in the forms of pleading. The corporal appearance of the defendant, indeed, is still generally required upon a criminal trial; the verdict of the jury must in all cases of treason and felony be delivered in open court in the presence of the defendant, but in cases of misdemeanor his presence during the trial is not essential. In civil actions the appearance is only constructive, all that is necessary being to file a paper or enter a memorandum on the record setting forth that an attorney therein named appears for the defendant.

An appearance is called *common* when entered by the plaintiff for the defendant in certain cases; it is *propria personâ* (in person), or by *attorney*, or by *next friend*, according as the party defends himself or employs an attorney or is under legal disability. It is *general*, *special*, or *conditional*, according as it is unqualified or made for some specific purpose or coupled with conditions. It is *voluntary* or *compulsory*, according as it is entered freely or in consequence of some adverse step of the plaintiff, or it is *optional* when made by a party who is under no obligation to appear, but does so, by leave of court, to save his rights. It is called *gratis* when entered by the defendant before it is legally necessary, and *subsequent* when entered after one has already been entered for him by the plaintiff. (J. M. G.)

APPLE. America has one native species of apple, *Pyrus coronaria*, but no attempt has been made to improve it. It is rather a large shrub than a tree. The flowers are as beautiful as those of the cultivated kinds. The fruit is as large as a small peach, and with a much more agreeable perfume than the ordinary apple, but too harsh in flavor for a cultivated taste. The apple of the Old World, the cultivated apple, is the leading fruit of America, and of more general value than perhaps all other fruits combined. The first trees known to bear on this continent were on Governor's Island, near Boston, and gave ten apples on Oct. 10, 1639. Trees found, however, near Indian villages indicate that the aborigines had knowledge of the fruit before this, probably through the French missionaries in Canada. Gov. Endicott established the first nursery near Salem, Mass., in 1640, importing the apple trees; and a tree planted in 1641, near Hartford, Conn., was still bearing some fruit in 1850. The first nurseries for raising apple trees were established near the city of New York and in New Jersey. Though there were large orchards, cider was the leading product until towards the middle of the present century, when peeling and drying apples in the sun, making apple-butter, and barrelling apples for export became objects of considerable commercial activity. Apple-butter is made by boiling six gallons of fresh cider down to one. Its manufacture was introduced by the Germans, but has not grown to be one of the great industries. By the invention of peeling-machines and dryers the cost of apple-drying has been reduced and much waste prevented; but the improvements by which apples are successfully barrelled, stored, and brought into distant markets, and the general culture of the tree everywhere, have made fresh fruit so cheap and abundant at all desirable seasons that the growing and marketing of fruit in this condition may be regarded as the chief object of apple-culture. The extent of this industry may be measured from the fact that Western New York alone ships annually about 2,000,000 barrels, worth to the growers about $3,000,000, and the value of the marketable apple crop in the United States is not less that $50,000,000 a year. Raising apple trees is a principal business of most nurseries, some having hundreds of acres with little else but these. They are grafted when but of one season's growth, and as many as two hundred bushels of apple-seeds are not

See Vol. II. p. 184 Am. ed. (p. 211 Edin. ed.).

unfrequently sown by a single firm, from which millions of "stocks" are produced, selling at from $2 to $6 per 1000. These stocks are grafted by boys and men during the winter season, packed in sand or sawdust in cellars, planted in nursery rows in the spring, and after two summers' growth are sold at wholesale at from $50 to $200 per 1000. The distribution is chiefly through agents or local dealers.

Refuse apples make cider, and the pomace, washed, yields the apple-seeds for stocks, the seeds bringing about $5 per bushel. The best apples are barrelled. For this purpose the fruit remains on the tree, in New York State, till about the middle of October, when it is hand-picked very carefully (all in any way injured being rejected) and placed softly, to avoid the slightest bruise, in perfectly clean barrels; and when the barrels are full the fruit is pressed in tightly by means of a hand lever adapted to the purpose. The apples are somewhat pressed into one another, but this kind of bruising does not injure them, as one fruit stays where pressed into the other, and the air is excluded from the bruise. It is the action of the air in exciting fermentation which causes decay. The barrels are left in some cool place till frost sets in, when they are stacked on their sides in cellars.

It is only in those parts of America where the autumns are early and cool that the apple for preservation can be raised with success. In the warmer portions even apples which, in other places, keep very well through the whole winter before maturing, ripen in the autumn. The great belt of the North American continent for about 100 miles north and south of the great lakes is the great American apple region. The Alleghany ridge through Pennsylvania, Virginia, and North Carolina is also famous for its successful apple-orchards. A tree at Morganton, N. C., has been known to yield 125 bushels in a single season, and one at Gainesville 120 bushels. The apples of these regions, though very large, do not color highly, nor do the very large fruit of Iowa and Nebraska; the same varieties in Michigan and Canada color beautifully. Many parts of California succeed well in preserving winter apples, but not to as great perfection as Oregon and Washington Territory.

Apple trees do not live as long in the States west as east of the Ohio River, the dryer climate not favoring longevity. About 50 years is the average duration of an apple tree there, or half the time of one farther east. In some favored Eastern locations trees have reached three feet in diameter; two feet is the average size.

Apple-culture has great drawbacks through insect enemies. The codling moth, *Carpocapsa pomonella*, is the most troublesome, as from its nocturnal habits birds do little to molest it. Where orchards are comparatively scarce and the insect pressed for food, scarcely an apple escapes "the worm." Gathering the fruit as it falls and feeding it to cattle destroys numbers, but many remain on the tree till mature, when they leave the fruit and crawl down the trunk to undergo their changes in the ground. These are caught in haybands placed around the trunk of the tree. This insect is European, and follows the apple all over the continent. The canker-worm, *Anisopteryx pometaria*, feeds on the foliage, and leaves the head as if scorched, but it does not follow the apple far in from the coast. The females are wingless and climb the tree. The borer, *Saperda bivittata*, is easily kept down by an annual examination of the trunk by wire and jackknife, and the bark-scale by various washes.

The apple tree is not subject to serious diseases in America, the "twig blight," by which branches one or two years old suddenly die in summer, being the worst.

The varying influence of climate and soil on the flavor and maturity of apples makes numerous varieties very desirable, and experimental plantings everywhere a necessity. Over 2000 kinds are named and described in Charles Downing's work. State societies, and a national body known as the American Pomological Society, issue yearly volumes of *Proceedings*. (T. M.)

APPLETON, the county-seat of Ontagamie co., Wis., is on both sides of the Fox River, 106 miles N. N. W. of Milwaukee and 185 miles from Chicago, on the Chicago and North-western Railroad. Its other railroads are the Wisconsin Central, the Milwaukee and Northern, and the Milwaukee, Lake Shore, and Western. The town is beautifully situated on a plateau 70 feet above the water; Fox River has a fall of 38 feet within the city limits, furnishing one of the most remarkable water-powers in the United States, while Lake Winnebago, 5 miles above, acts as a vast natural reservoir. The principal industry is the manufacture of paper from wood-pulp; there are eight paper- and pulp-mills, six flour-mills, two woollen mills, flax-mills, blast-furnace, and two foundries, as well as manufactures of boots, shoes, toys, knit goods, nails, etc. The total value of its manufactures in 1881 was $3,620,000. The city has seven hotels, three national banks, one daily and three weekly newspapers, ten churches, a high school, and seven other public schools. It is also the seat of Lawrence University, founded in 1849 by Amos Lawrence of Boston, and under the patronage of the Methodist Episcopal Church. This institution has 12 professors, 71 collegiate students, and 175 other students. The Appleton Library, now containing 9500 volumes, is under the control of the university, but open to all residents, and is maintained by an endowment given in 1854 by Samuel Appleton of Boston. The city is named in honor of Mr. Appleton, and was settled in 1848, the first building being a frame house for Lawrence University. It was incorporated as a city in 1857, and its present population is a mixture of New York and New England with German and Scandinavian elements. It is provided with gas, water-works, and a telephone exchange. The assessed valuation of its property is $2,343,594; its public debt is $93,000, and its annual expenses are $34,000. Fox River has been improved by the general Government at great expense, and is now navigable for small steamers. The population of Appleton by the national census of 1880 was 8005; by the school census of 1882 it is 9004.

APPLETON, CHARLES EDWARD (1841–1879), an English journalist, was born at Reading, March 16, 1841. His education began at the Reading school, of which his father, Rev. Robert Appleton, had been for many years head-master, and was completed at St. John's College, Oxford, where he graduated B. A. in 1863, and subsequently took the degree of D. C. L. He afterwards visited the Continent, and studied in the universities of Heidelberg and Berlin. In 1867 he was appointed lecturer in philosophy at St. John's College. Becoming convinced of the need of a weekly review of a high standard, and written by experts in various departments of study over their own signatures, he founded *The Academy*, the first number appearing Oct. 9, 1869. To this periodical he devoted himself with energy and success. The state of his health having obliged him in 1877–78 to travel in the south, he made an elaborate tour of Egypt and the Levant, partly in company with Prof. Blackie. His health not being restored, he returned to the Mediterranean in the winter of 1878–79, and died at Luxor, Upper Egypt, on Feb. 1, 1879.

Dr. Appleton's studies were devoted to literature and philosophy rather than to science, yet he rendered very valuable services to the cause of science. He may be regarded as the originator of the movement for the endowment of scientific research, and it is greatly due to his energy and influence that the Government took any action in this direction. In 1872 he called a meeting at the Freemasons' Tavern, at which it was definitely declared that the universities should have some higher aim than the routine education of young men, and that original research in colleges should be encouraged by the Government. He continued to take a very active share in the agitation for this purpose, which finally resulted in the passage of the University Act of 1877. He was also deeply interested in the question of international copyright, particularly after his visit to America in 1875. His chief contribution to this cause was an article in the *Fortnightly Review* of Feb. 1877, on "American Efforts after International Copyright." Besides numerous letters in the *Times* and other journals, he wrote two elaborate *Essays on the Endowment of Research* (1876). The bent of his mind was towards philosophy and theology, and he was an earnest student of Hegel, on whose works he wrote several articles. He also contributed profound and elaborate articles on "Doubt," "Atheism," and several other subjects to *Blunt's Dictionary of Doctrinal and Historical Theology*. A volume on his *Life and Literary Relics* was published in 1881 by J. H. Appleton (his brother) and A. H. Sayce. (C. M.)

APPOMATTOX COURT-HOUSE, the county-seat of Appomattox co., Va., is about 80 miles west of Richmond and 20 miles east of Lynchburg. It is 4 miles north of Appomattox Station on the Norfolk and Western Railroad. The village became famous as the scene of the surrender by Gen. Robert E. Lee of the Confederate Army of Northern Virginia to Gen. U. S. Grant, April 9, 1865; which event substantially brought to a close the War of the Rebellion.

On April 2d, Gen. Lee, finding that Gen. Grant had commenced a movement to cut off his communications with the South, quietly evacuated Richmond and Petersburg, and began a retreat to Burkesville on the Danville Railroad. Owing to a misunderstanding of previous orders, the Confederates suffered severely from want of provisions, and lost time in foraging. When Gen. Sheridan's corps of cavalry intercepted them at Sailor's Creek (April 6), Gen. Lee's forces crossed the Appomattox River, but were unable to destroy the bridge behind them. On the next day Gen. Grant opened a correspondence, inviting Lee to surrender in order to avoid "further effusion of blood" as useless. Lee, still continuing his retreat, wrote that he did not yet consider resistance as hopeless, but when, on April 9, he found that Gen. Sheridan had planted a force of infantry at Appomattox Court-house, directly on his line of retreat, he requested an interview with Gen. Grant, and arrangements were made for holding it at the residence of Mr. Wilmer McLean, a comfortable frame house with a long porch. Here, on the afternoon of Sunday, April 9, the two commanders met, each attended by part of his staff and some of his subordinate officers. At Gen. Lee's request, Gen. Grant stated in writing the terms on which the Army of Northern Virginia would be admitted to surrender. These were, briefly, that the officers and men should be paroled not to take arms against the Government of the United States until properly exchanged, and that after the arms, artillery, and public property had been given up the officers and men should be allowed to return to their homes undisturbed; officers were also allowed to retain their side-arms, private horses, and baggage. Gen. Lee promptly accepted these terms, and after a brief interview returned to his camp to announce the result to those under his command. The occasion was affecting; he was barely able to say to his troops, "Men, we have fought through the war together. I have done the best I could for you." The next day he wrote a general order bidding farewell to his army. The actual surrender was made by commissioners. On April 12 the Confederates marched by divisions to Clover Hill, four miles north of Appomattox Court-house, and there stacked their arms. Less than 8000 had muskets in their hands, but the capitulation included also 18,000 unarmed. In all, 16,000 small-arms, 150 cannon, 71 colors, about 1100 wagons and caissons, and 4000 horses and mules were surrendered.

APPORTIONMENT. See CENSUS and CONGRESS.

See Vol. II. p. 185 Am. ed. (p. 212 Edin. ed.).

APPRENTICESHIP. In the United States apprenticeship followed English laws and customs. The statutes of the several States governing the contract of apprenticeship, many of them dating back to the last century, are substantially like those of England, and the only amendments adopted in recent years recognize the gradual decadence of the old-time system. Thus, the Pennsylvania law of 1865 provides that no apprenticeship shall be considered void on account of the want of indentures if a contract can be otherwise proved. The essential features of the apprenticeship system are that the apprentice is bound to serve the master for a term of years, and that the master is bound to clothe and feed him, to teach him the trade or handicraft agreed upon, and, in most States, to provide him with a certain amount of education or to allow him to attend school for a fixed term or terms. The laws on the subject, which vary somewhat in the several States, prescribe penalties for the failure to observe the terms of the contract on the part either of the apprentice or the master, regulate what settlement shall be made in the event of the long-continued sickness of the apprentice, the failure or death of the master, etc., etc. One result of the gradual subdivision of trades into specialties, the use of duplicate forms, and the general development of factory-labor, has been that masters have been tempted to keep their apprentices at work in branches where they were skilful, and to fail to teach them the "full" trade. Suits at law, in which the apprentice, being free, claimed damages from his former master, have arisen in consequence. In Pennsylvania the principle has been fairly established that the master is bound to teach his apprentice to do such work as in the ordinary course of business comes to the shop or to the department where the apprentice works. At the same time, the courts have so far recognized the division of trades into specialties that a substantial compliance with the general rules is all that is required. Although the apprenticeship system was transplanted to America in the laws and customs of the several colonies and States, it was probably never as strong an institution in the United States as in England. In the latter country and in many parts of Europe the guilds, whose rules had been embodied in legislation, did much towards making the laws effective. A runaway apprentice had few opportunities of obtaining employment at his trade, the masters being bound together and refusing to accept journeymen who could not present satisfactory papers. There were no corporations in this country precisely analogous to the guilds, though a few, like the Carpenters' Company of Philadelphia, had been organized in imitation of these old craft institutions. In the early part of this century efforts were made to enforce the contract of apprenticeship. Public advertisements prohibiting the harboring of runaway apprentices were quite common in the newspapers of the day, but in a new country it was not difficult for the runaway, in spite of such warnings, to escape arrest and obtain employment. The introduction of the factory system of doing work, and the consequent division and subdivision of trades into several branches, gradually undermined the apprenticeship system in the larger cities and towns, and the continued development of the factory system consequent upon the introduction of steam-power and machine tools hastened its abandonment wherever half-skilled labor could be employed. The spread of the public schools also had some effect, probably, in making apprenticeship distasteful to young men. The education there received not only tended to make young men ambitious to enter the professions or mercantile life, but fitted them better for such pursuits than for mechanical employment. The same causes were at work in all communities to break down the old-time apprenticeship system, and produced similar effects in Europe, but probably not to the same extent as in the United States, where the factory system, the use of machine tools, and the public schools have all had a very high, if not the highest, development. The need of skilled hand-labor has not been diminished, however, by the introduction of improved appliances for doing work. The demand for greater perfection in the products of labor has kept pace with the increase in facilities for meeting it, and dependence must ultimately be placed on hand-labor for the best products of mechanical skill. But within the century the industries of man have been completely revolutionized. Capital has been concentrated in vast manufactories, executive ability has been called in to guide mechanical skill, workmen have been divided into groups, each of which forms but a part of the machinery, and is expected to perform but one simple operation, though the results of the labor of many such groups being assembled may assume the form of such an intricate piece of machinery as a watch, for example. There is no room in such a factory system of labor for the apprentice. A few days or a few weeks suffice to teach a boy or girl to attend the single machine placed in his or her charge, and thus employment may be found for hundreds of half-skilled workers who never learn a trade in the ordinary sense of the word. But the factory system and the use of machine tools greatly decrease the cost of production and the price of the product. The multiplied capacity of production is met by a greater demand; and as, somewhere in the course of the manufacture, highly skilled labor must be employed to assemble and fit the parts or to make the machines whose operations effect this saving, the demand for such labor remains at least as great as in the days of a smaller production by hand-work alone. New trades are sometimes created and old ones disappear on the introduction of new inventions, and for a time skilled labor of a particular kind may not be in demand, but as a general truth it may be affirmed that there is as much need to-day as ever for skilled mechanics.

In the larger cities of the United States the apprenticeship system in its old form has almost died out, but in the smaller towns and villages, where the conditions are favorable for the master to take the apprentice into his house and teach him a full trade, it still exists; and it is from these smaller towns that the supply of skilled mechanics required in the larger cities is mainly derived. An estimate based on the census returns of 1880 fixes the number of persons engaged in the manufacturing and the mechanic arts at about four millions and three-fourths of these live in cities of less than 20,000 inhabitants, in towns, villages, and smaller settlements. Only one million out of the four are in the great manufacturing centres, where social conditions, the factory system, and the general use of steam-power and machine tools have to a greater or less extent broken down the old system of learning trades. In some of the cities having over 20,000 inhabitants, even in such important manufacturing centres as Wilmington, Del., the old apprenticeship system has been retained, though greatly modified by the use of machine tools in the larger establishments. A recent examination of workshops, mills, and manufactories of various kinds in Philadelphia showed that apprenticeship by written indentures had been generally if not wholly abandoned. The absence of a contract, though it deprives the master of the power (merely nominal at present) of compelling the apprentice to serve him, also releases him from the obligation to retain in his employment an idle or vicious boy. Hence employers generally prefer to hire boys under a merely verbal agreement from week to week, the boy being free to leave at any time, and the master free to discharge him. Under this system many fail to learn the trade they begin to learn, or become half-skilled workmen and seek higher wages in other shops. In the biography of James Nasmyth of Manchester, England, the inventor of the steam-hammer, the author says: "But the arrangement which we greatly preferred was to employ intelligent, well-conducted young lads, the sons of laborers or mechanics, and advance them by degrees according to their merits. They took charge of the smaller machine tools, by which the minor details of the machines in progress were brought into exact form without having recourse to the untrustworthy and costly process of chipping and filing. A spirit of emulation was excited among them. They vied with each other in executing their work with precision. Those who excelled were paid an extra weekly wage. In course of time they took pride not only in the quantity, but in the *quality*, of their work, and in the long run they became skilful mechanics. . . . Every one of these lads was at liberty to leave at the end of each day's work. This arrangement acted as an ever-present check upon master as well as apprentice. The only bond of union between us was mutual interest. The best of them remained in our service, because they knew our work and were pleased with the surroundings; while we, on our part, were always desirous of retaining men we had trained, because we knew we could depend upon them. Nothing could have been more satisfactory than the manner in which this system worked." In the management of the few boys who were actually apprenticed Mr. Nasmyth found great evils arising from the carelessness and neglect of employés who could not be discharged. He endeavored to correct this by agreeing that the premiums (paid for the boys) should be payable in six months' portions, and that each party should be free to terminate the connection at the end of each succeeding six months or at a month's notice from any time. But even this arrangement did not prove as satisfactory as that of employing the learners, without agreement, from week to week or from day to day. Many different systems have been employed to keep these "learners" at their trades, such as the offering of bonuses to those who serve a certain time, the grading of wages on a rising scale according to the time served, etc. It has become evident, however, that no device of this kind will ensure the mechanical education of a sufficient number of workmen, or enable any to learn their trades thoroughly, because of the subdivision of labor under the factory system. Attention has therefore been turned to the establishment of trade-schools. The census returns of 1870 and 1880 show that there is a great field of supply of skilled labor yet unaffected by the changed and changing social and mechanical conditions that have deprived city workshops of their apprentices, but it is also evident that this source is continually being encroached upon by the same causes that have already deprived city workshops of their pupils, and that a new system of educating mechanics will be needed to take its place. The Imperial Technical School of Moscow, Russia, has been taken as the model upon which to found several American institutions for giving instruction in the mechanic arts. The School of Mechanic Arts of the Institute of Technology, Boston, Mass., is the most prominent of these. It was established Aug. 17, 1876, and has been followed by the Mechanic Art Instruction of the State College of Maine, the Department of Mechanic Arts, Purdue University, Lafayette, Ind., the Mechanical Handiwork Schools of the Spring Garden Institute, Philadelphia, and the Manual Training-School of Washington University, St. Louis, Mo. Trade-schools, proper, have also been established in New York and other American cities. The most significant movements of this kind perhaps, showing the tendency to substitute technical schools for the apprenticeship system, are the establishment of the Technical College at Finsbury (England) by the council of the corporation and guilds of London, and the resolution of the Apprentices' Library Company of Philadelphia, adopted at the annual meeting held in April, 1883, to apply for such an amendment of its charter as should permit it to establish mechanical handiwork schools for the practical training of mechanics. The guilds of London, now engaged in educating mechanics in the lecture-room and in practice-shops, were at one time the main supporters of the apprenticeship system in England; the Apprentices' Library of Philadelphia was established for the use of "apprentices only." The aim of all the schools following the Russian model is to give general mechanical education fitting the learner to enter any mechanical trade with a knowledge of mechanics and with hand skill, whereby he may in a short time adapt himself to any trade. The pupil receives what may be called laboratory instruction, and spends a large part of his time in the practice-shops. The school of the Spring Garden Institute, Philadelphia, is open in the evenings for the training of young mechanics who have shop-practice as a part of their daily work. Efforts are also being made to have manual training introduced as a branch of public-school education. Thus, while apprenticeship has disappeared from the great cities, and is probably doomed to decay in the much larger part of the working community living in small cities and villages, it seems likely to be replaced at no distant day by another system of mechanical training, presenting many advantages, from an educational point of view, over that system which served so well in the days when an apprentice was the sole help of his master, lived with him, and could learn a complete trade by long practice, if not from precept. (A. B. B.)

APPROPRIATION OF PAYMENTS, the application of a payment made by a debtor to a creditor to one or more of several debts.

By the civil law, where a debtor made a payment to his creditor to whom he owed several debts, he might specify the particular debt to which it should be applied. If he failed to do so, the courts applied the payment to the debt which it was most advantageous for him to discharge. By the common law, a debtor is also enabled to appropriate a payment made by him upon what account he pleases. He must, however, manifest his intention, either expressly or inferentially, at the time of making payment, and in such a manner that the creditor may have knowledge of it. He must also pay the whole of any debt then due and payable, and cannot claim the right to extinguish it partially. He must also discharge all the interest in arrear upon any debt before he can claim to have his payment applied on account of the principal. This right of appropriation on the part of the debtor applies only in case of voluntary payments, and does not exist in the case of payments *in invitum* or by process of law.

Where a debtor manifests no intention as to the application of the payment, the creditor may apply it to any demand then due and payable which he pleases, even though it may be barred by the statute of limitations. The creditor cannot, however, apply the payment to any demand which is illegal, indefinite, or contingent in its nature, either in its essential character or as to the time of payment. Where there are two debts, each exceeding the amount paid, the creditor may apply the payment on account of either of them, but cannot split it up and apply it partly on one demand and partly on the other. In some cases, however, this course is said to constitute the creditor's duty; as, for example, where he holds one debt in his own right, and the other as trustee for a third person.

Where a debtor has waived his right of application in favor of the creditor, it will be presumed that he could not have intended to authorize such an application by the creditor as would work him an injury. The creditor cannot, accordingly, make such an application as will put the debtor in jeopardy, either as to his estate or reputation.

It is not necessary that a creditor should make application of a payment immediately on receipt of the same, but how much time he has thereafter in which to make it seems undetermined.

Where either party has once made a lawful application of a payment, or has acquiesced in any application thereof made by the other party, or where either party has omitted to make such application as he was entitled to make, in all such cases such party is concluded by his negative or affirmative action, and cannot in the one case thereafter change any application which has been made, or in the other case revive the lost right of appropriation.

Where neither the debtor nor the creditor applies the payment, the court will make the application, according to the justice and equity of the case, for the benefit of both parties. There are certain principles laid down by the courts in these cases which are of frequent application: (1) Where there is one continuous account of several items, the payment will be applied to the item having priority of time. (2) A payment will be applied first to extinguish interest, and then principal. (3) A payment will be applied so that the debt having the most precarious security may be first extinguished. (4) A payment will be applied to a legal claim in preference to one not enforceable at law; to a certain or conceded claim in preference to an indefinite or disputed one; to an existing demand in preference to a future or contingent one or one not yet due; and to a transaction affecting the party directly and personally, and not collaterally or in some other capacity. (5) Where the fund out of which the money arises consists of the proceeds of any particular property the payment will be applied on account of any debt secured by mortgage, pledge, or otherwise on such property. (L. L., JR.)

APPURTENANCES (Low Lat. *appertinentia*), in law, things belonging or incidental to or connected with another more important thing and necessary for its enjoyment. In a conveyance of land it is usual to add, after the description of the property, "together with the appurtenances." The term includes strictly only "incorporeal hereditaments;" that is, rights, such as a right of way over another's land or a right of pasture in it, a right to take or use water-power, etc., incidental and necessary to the tract conveyed—some collateral right, in short, existing for its benefit. Appurtenances never include other land, as an adjoining strip; they must be of a different and yet congruous nature. At most, the grant of a house with the appurtenances will pass the garden and curtilage (or enclosure around a dwelling-house) with it, but in such cases it is more accurate to speak of the land as parcel of the house rather than appurtenant to it. In a will the construction is more liberal.

In maritime law, the term is generally used as synonymous with "apparel" or "furniture," to designate whatever is on board a ship for the objects of the voyage and adventure in which she is engaged. Thus, the boats, cables, anchors, and provisions are appurtenances of a ship; her ballast and cargo are not.

APRICOT. The soil and climate of most portions of the United States have been found very favorable to the growth of the Apricot and to the great perfection of the fruit. In the drier regions Apricots do even better than in the eastern districts. They may be grown as standard trees in orchards, as apples or peaches are, care being taken in those places where warm winter days occur to choose such situations as are not favorable to the excitation of the flowers until the regularly settled springtime shall arrive. Up to the early part of the present century they were grown in considerable numbers in the interior of Pennsylvania, especially in the region watered by the Susquehanna River, but the great increase of the plum-weevil (*Conotrachelus nenuphar*), which is also particularly destructive to the fruit of the Apricot, caused their culture to be almost abandoned. In the earlier days of the settlement of Salt Lake City the great beauty of the rich golden fruit on the trees everywhere abounding gave the city one of its peculiar charms to strangers. A dry climate being somewhat unfavorable to the plum-weevil, or curculio, this fruit will probably find a more or less successful location there. The warmer parts of California are also very favorable to apricot-culture, and it is one of the most popular of the orchard fruits of that State. The flesh is of a rich golden color, with a melting texture, and the fruit is one of the most delicious when properly matured. It is not well adapted to shipping purposes. (T. M.)

See Vol. II. p. 186 Am. ed. (p. 214 Edin. ed.).

AQUEDUCTS. The term *aqueduct*, in its most comprehensive sense being any conduit for the conveyance of water, may be applied to a great variety of structures, as to bridges of all descriptions and varieties of material, pipes of all kinds, whether of wood, metal, or stone, or to tunnels, either subterranean or subaqueous. Aqueducts may also be classified according to their use, as for water-supply for cities, for milling and manufacturing, or for navigation. In this comprehensive field it is only possible to refer briefly to the progress and improvements which have been made in their construction, as illustrated by some of the most prominent typical structures in this and other countries.

See Vol. II. p. 191 Am. ed. (p. 219 Edin. ed.).

The ancient Roman system, so justly celebrated for its massive arcades of masonry conveying water on a uniformly descending grade over the broad campagnas surrounding the Imperial City, was a creature of circumstance, for, although the principle of the inverted syphon was fully understood at that early date, and even applied on a small scale in the baths of cities, the imperfect condition of the arts was such that it was impossible to apply it to large volumes of water flowing under considerable head. Iron pipes of large diameter were unknown, and masonry or cement conduits could not be built strong enough to withstand so great pressure. Before the extensive application of iron to engineering structures wooden and leaden pipes were used to a limited extent. Telford began introducing iron into aqueduct bridges first in the shape of flat flanged plates about 1805 (see description of the Pont-y-Cysylte Aqueduct, *seq.*). This combination of iron with masonry was found to be lighter and cheaper than structures built entirely of masonry, and quite as efficient, and was extensively resorted to by the engineers of that period. At a later date wrought- and cast-iron pipes were largely substituted for the plates and masonry, whilst the modern practice consists in combining syphons and tunnels of large diameters, as will be seen in the following descriptions.

Chirk Aqueduct of the Ellesmere Canal, over the River Ceiriog, in Wales.—This is built of masonry and iron combined. It is 710 feet long, 70 feet above the level of the river, and 22 feet wide at top, including parapets. There are ten full-centre arches, each having a span of 40 feet. The water-way is 11 feet wide by 5 deep. The piers are 33 feet long by 13 wide, and the spandrils are filled with longitudinal walls supporting the cast-iron plates which form the bottom of the canal. These plates are joined by bolts passing through the flanges. The sides of the trunk, 5 feet 6 inches thick, are composed of ashlar backed with hard-burnt brick laid in cement, and the outside is faced with rubble similar to that in the piers and arches. The work was commenced June 17, 1796, and completed in 1801, at a cost of $100,301. The quoins, coping, and lining of the sides of the water-way are of ashlar; the rest of the masonry is of rubble laid in good lime mortar. The iron plates forming the bottom, introduced by Telford, were used for the first time in this structure, and served the double purpose of ties and supports, preventing the side-walls from spreading and the trunk of the canal from leaking or the arches from being thrown down, as had happened to similar structures, from the freezing of the clay puddling.

Aqueduct of Pont-y-Cysylte, on the Ellesmere Canal, over the Dee at the Vale of Llangollen.—On the south side of the valley an embankment was pushed forward, 1500 feet in length, until its height was 75 feet, leaving 1007 feet to be spanned over the Dee, 127 feet below the level of the canal. An ordinary aqueduct of masonry would have been hazardous and enormously expensive, so that the engineer, Mr. Telford, had recourse to an iron superstructure (which has since been frequently used in aqueducts), supported on solid sandstone piers 121 feet high above low water, 20 feet long, and 12 thick at the level of high water, and 13 feet by 7 feet 6 inches at the top. They are solid to a height of 70 feet from the base, the remaining 50 being hollow; the exterior walls, 2 feet thick, are connected by one cross-wall within the piers, thus lowering the centre of gravity and saving masonry. The towpath, 4 feet 8 inches wide, rests upon iron pillars in the water-way, which is 11 feet 10 inches in width, leaving 7 feet 2 inches for the boats, which were 6 feet wide. The depth of water in the canal is 5 feet. There are nineteen segmental arches of 45 feet span and 7 feet 6 inches rise, composed of cast-iron flanged plates bolted together. The bridge was opened for use in 1805, at a cost of only $225,701, and was justly regarded as one of the most successful engineering feats of its time.

The *Cast-iron Aqueduct-Bridge* over the London and Chester road, near Nantwich, England, was built by Thomas Telford, C. E., about 1826. It forms a portion of the Birmingham and Liverpool Junction Canal, built to avoid the circuitous route and large amount of lockage (320 feet) *viâ* the Duke of Bridgewater Canal and Hardcastle Tunnel. The aqueduct is a single cast-iron plate arch of 30 feet span and 4 feet rise, supported upon solid masonry abutments with cylindrical wings. The bottom of the trunk, which is level, rests upon six segmental iron ribs 6 feet 8 inches apart. The towpaths, 4 feet wide, on either flank, are composed of cast-iron flanged plates, supported outside upon the heads of the arch and inside upon iron columns. They are placed at water-level, which is 5 feet above the floor. The contraction of the water-way is formed of an apron of masonry connecting the earthwork with the iron superstructure, forming an inner revetment or slope-wall opening outward from the bridge like a funnel. The headway of the road under the aqueduct is 17 feet in the clear at the crown of the arch, and 13 feet at the springing lines.

The *Aqueduct of Roquefavour*, over the Arc, on the canal from Durance to Marseilles, France, is 393 metres (1289 feet) in length; the maximum height above the base of the pedestal is 82·65 m., or 271 feet, and the breadth at top 14·76 m., or 48·4 feet. This grand structure is composed of three stages of arches, the lowest of which contains twelve spans, of 15 m., or 49·2 feet, each; the second or middle stage, fifteen spans, of 16 m., or 52·5 feet, each; and the third or highest, fifty-three small spans, of 5 m., or 16·4 feet, each. The height of the lowest tier from base of pedestal to first platform is 34·1 m. = 111·85 feet; that of the intermediate stage is 37·6 = 123·30; and that of the upper stage to top of parapet is 10·95 = 35·92—making the total height of 271·07 feet. The piers, which are strengthened by counterforts, are 5 m. = 16·4 feet thick at the springing of the arches of the second stage, 6 m. = 19·7 feet at the springing of the first, and 6·57 m. = 21·55 feet at the top of the pedestal, which is 7·2 m. = 23·62 feet high. The length of the piers is uniformly 4·85 m. = 15·9 feet in the middle, and 5·5 m. = 18·04 feet in the lower stage. The great arches are 1·0 m. = 3·28 feet thick at the crown. The small upper arches are 1·05 m. = 3·44 feet thick, and their piers are 4 m. = 13·12 feet high, including the string-course, and 2 m. = 6·56 feet thick at the springings. The trough is in brickwork, having a breadth of 2 m. = 6·56 feet at bottom, 2·3 m. = 7·54 feet at top, and 2·4 m. = 7·86 feet in height. The pressure of the base of the piers is approximately 32,300 pounds per square foot. The cost of this work, which was not performed by contract, amounted to $740,000, or about $30 per cubic yard. The gradient of $\frac{8}{1000}$ gave a discharge of 198,000 gallons per minute. The aqueduct was designed and built between the years 1841 and 1847, under the direction of M. de Montricher.

The Suspension Canal Aqueduct at Pittsburg, Pa., was built by Mr. John A. Roebling in 1845. It has seven spans of 160 feet each. The canal trunk is supported by two cables, each 7 inches in diameter, having a versine of 14½ feet. The cables contain 3800 No. 10 wires, giving a net area of 53 square inches. The ultimate strength of each wire is 1100 pounds, or 35·2 tons per square inch of solid section; total ultimate strength.

1866 tons. The trunk is of wood, weighing 111 tons per span, while the pressure of water, which is 4 feet deep and 14¾ average width, weighs 265 tons, making the total weight 276 tons. The strength of the cables is 3·4 times the constant strain upon them. The tow-path on one side and footpath on the other are each 7 feet wide. Were these occupied with horses and people, the factor of safety would be reduced to 3·0. The aqueduct is very steady, but formerly leaked badly along its lower corners.

Monolith of Béton Aggloméré.—As illustrative of the increasing resources of the engineer in his search for appropriate materials to construct durable public and private works, we mention the Vanne aqueduct, an important and costly structure built to supply the city of Paris with water. Of this conduit a section 37 miles in length is composed of a material known as BÉTON AGGLOMÉRÉ (*q. v.*). It traverses the forest of Fontainebleau through its entire length, comprising 2½ to 3 miles of arches, some of them 50 feet high, and 11 miles of tunnels, nearly all constructed of excavated material, the impalpable sand of marine formation known as Fontainebleau sand. It includes also eight or ten bridges of large span (75 to 125 feet) over rivers, canals, and highways. The smaller arches are "full-centred," having a span of 39·37 feet, with a thickness at the crown of 15·75 inches. The spandrils are filled in with open arches, forming arcades upon which the aqueduct pipe is moulded. The pipe is circular, having an interior diameter of 6½ feet, with a thickness of 9 inches at the top and 12 at the haunches, at water-surface. About two weeks were allowed for the arches to harden before the pipe was built, and one week after that the centres were "struck." Although the work was carried forward continuously during all seasons, it was not found to be injuriously affected by the extremes of temperature. The water was let in the pipe in the spring of 1869, when the inspector reported that "*the impermeability appeared complete.*" (See figs. 1, 2.)

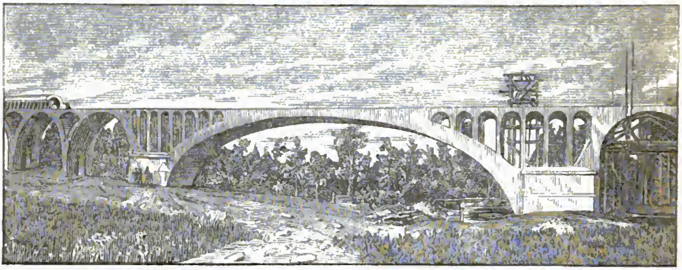


FIG. 1.—Arch in the Vanne Aqueduct.

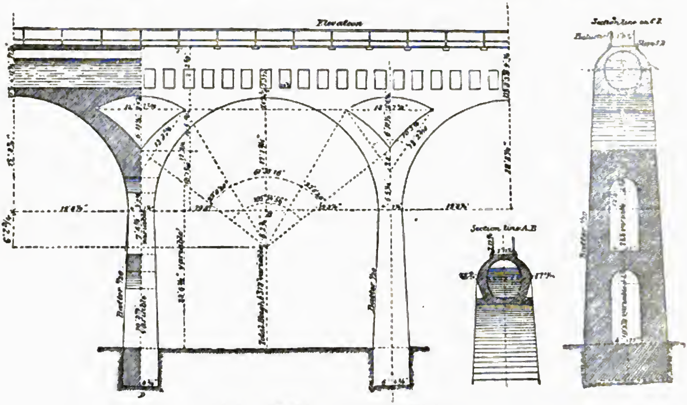


FIG. 2.—Details in Arch, Vanne Aqueduct.

Iron Pipe-Aqueduct over the Wissahickon, in Philadelphia, Pa.—This bridge, which is on a line of mains to supply Germantown with water from the Roxborough reservoir, was designed by Mr. Frederick Graff, C. E., and built by Mr. John Murphy, C. E., in 1870. This simple and economical design was first applied by its inventor in carrying the supply-mains, 36 inches in diameter, across the forebay at Fairmount Waterworks, Philadelphia, in 1868, and was found so successful that it was afterwards extended to longer spans.

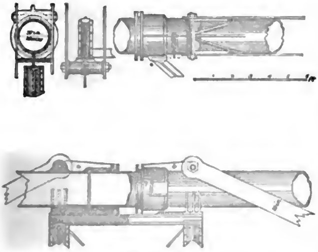


FIG. 3.—Details, Wissahickon Pipe-Aqueduct.

The structure above referred to consists of two parallel lines of flange pipe 20 inches inside diameter. These pipes, 14 feet apart from centre to centre, forming the compression members of the bridge, are each supported upon short Phœnix posts 5⅜ inches in diameter, resting on chains formed of long links or eye-bars having a sectional area of 10 square inches each. The ends of the chains are attached to lugs on top of the pipe at the ends of each span. Each of the three piers is formed of wrought-iron "Phœnix" columns 8⅜ inches in diameter, thoroughly braced and resting upon low masonry foundations 7 by 14 feet in horizontal section.

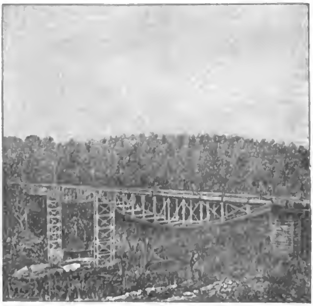


FIG. 4.—Wissahickon Pipe-Aqueduct.

There are four spans, each 165 feet 9 inches in length in the clear. (For details and elevation see figs. 3, 4.) It was erected in four months and at a cost of $100,000.

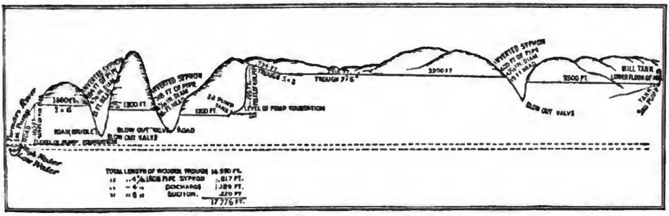


FIG. 5.—Profile of Aqueduct from Yuruari River, Venezuela.

Aqueducts for Water-Supply (*Milling and Mining*).—An ingenious, economical, and successful application of hydraulics was made in 1877 in the gold-regions of Venezuela by William A. Biddle of Philadelphia, in conveying water from the Yuruari River to a stamp-mill about three miles distant, by means of a combination of open troughs, syphons, and pumps, through a country without roads and very difficult of access. The first pump, at the river, raised the water 160 feet into an open trough, 7 by 6 inches inside, made of inch boards, laid along the side-hill, on a descending grade of ·3 per 100, for a length of 4100 feet. The line crossed two deep ravines by inverted syphons, of boiler flues 5 inches outside diameter, 4·7 inside (one 694 feet, the other 518 feet long), delivering the water to the second pump at the foot of a range of hills. Here a second lift of 195 feet was made into another line of troughs similar to the first, but 10,450 feet long, with a syphon of 605 feet long, by which the water was carried to a ravine immediately below the mill, whence a third pump run by the mill-boilers raised it to the tank. (See profile, fig. 5.) The total surface-length was 17,300 feet, and the total head gained was 310 feet. The native lumber of which the troughs were made was so hard and heavy that nails could not be driven near the ends of the boards without splitting them, making it necessary to bore the holes. The troughs were supported on low posts in brackets (as shown in figs. 6, 7), placed at intervals of from 12 to 16 feet, and were so stiff and strong as to need no intermediate supports. The "heads" of the water in the syphons were calculated for a discharge of 35 cubic feet per minute, by the formulæ of

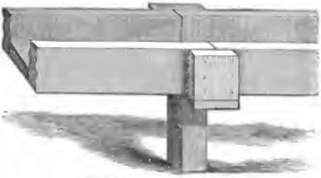


FIG. 6.—Detail of Trough.

Ethelwein, Weisbach, and Trautwine, and that one taken which gave the greatest discharge. The imperfect test made after the completion gave a computed discharge of 20 cubic feet per minute, and there was found to be an excess of head in the syphon, as the water did not fill the high side before overflowing at the exit. The heads were, respectively—in the first syphon 21 feet; in the second, 16 feet; and in the third, 19 feet.

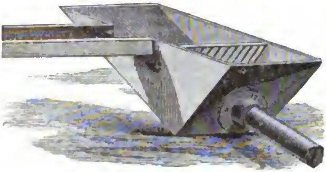


FIG. 7.—Filter at head of Syphon.

This same principle was much more extensively applied about the same time in the United States in conveying crude petroleum from the oil-regions of Western Pennsylvania to tidewater (see PETROLEUM PIPE-LINES), and in California for hydraulic mining.

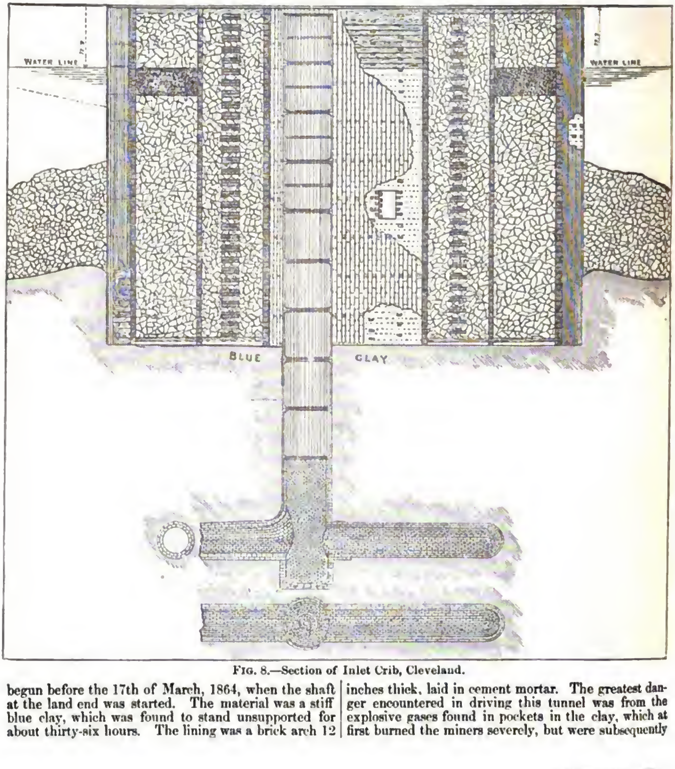


FIG. 8.—Section of Inlet Crib, Cleveland.

Submarine Aqueducts or Tunnels for Supplying Lake Cities with Water were first suggested by E. S. Chesborough, C. E., engineer for the Board of Public Works of Chicago, Ill., who made a report to the board in 1861 recommending the construction of a tunnel 10,567 feet long, extending out under Lake Michigan far enough to ensure an abundant supply of fresh water. There were two shafts, one at either end. That in the lake was protected by a hollow pentagonal crib surmounted by a lighthouse and the keeper's dwelling. The conduit was a brick tube having a horizontal diameter of 5 feet, and a vertical one of 5 feet 2 inches for convenience in drawing the centres. These dimensions gave a discharge of 50 gallons *per diem* for each person in an assumed population of 1,000,000. The contract was let Oct. 20, 1863, for $315,139, but work was not begun before the 17th of March, 1864, when the shaft at the land end was started. The material was a stiff blue clay, which was found to stand unsupported for about thirty-six hours. The lining was a brick arch 12 inches thick, laid in cement mortar. The greatest danger encountered in driving this tunnel was from the explosive gases found in pockets in the clay, which at first burned the miners severely, but were subsequently consumed by boring small auger-holes into the pockets and igniting the escaping gas, which burned in a small jet until all was consumed. In the interior of the crib there was placed an iron cylinder of 9 feet internal diameter, which connected with the lake end of the conduit, and through valves in which the water was admitted from the well inside the crib. This aqueduct was opened for use in March, 1867, or five years after the work was started, and was found to have cost $457,814.95. It is justly celebrated as being one of the most novel, successful, and economically executed engineering enterprises of the century. Its distinguishing feature is the boldness of its conception, for there happened to be no unusual engineering difficulties encountered in the work. This conduit was soon supplemented by a parallel tunnel from the same crib, but built with a larger sectional area (7 feet by 7 feet 2 inches). This second tunnel, which was only 50 feet from the first, has a capacity of 100,000,000 gallons daily, whilst that of the old tunnel was but half of this amount. The total length of the new tunnel is 31,490 feet, of which 10,810 feet belong to the lake portion and 20,680 to the extension inland. The top of the conduit at the west pumping-works is 21 feet below low water in the lake. The estimated average velocity of water in the tunnel when discharging its full capacity is 4 feet per second. This work was commenced July 12, 1872, and completed during the winter of 1874–75, at a total cost of $1,638,249.92, distributed as follows:

For new tunnel between crib and shore....	$414,709.36
" extension of same to south branch.....	542,912.63
" new pumping-works.........................	497,272.62
" stone structure at crib.......................	63,711.31
The enlargement of pipe will cost less than	119,644.00
Total	$1,638,249.92

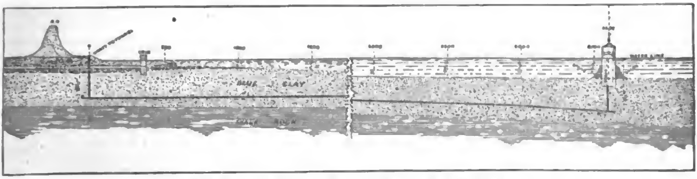


Fig. 9.—Longitudinal Section, Cleveland Aqueduct.

The Cleveland Lake Tunnel (figs. 8, 9, 10), designed upon the Chesborough system, was commenced Aug. 23, 1869, and completed March 2, 1874, at a cost of $320.351.72. Its cross-section was the same as that of the first tunnel at Chicago. Its length when finished was 6661·61 feet. The lake shaft was 90·2 feet below water-level, whilst the depth of the shore shaft was 67·5 feet. The engineer was Mr. John Whitelaw. The details of this work were similar to those of that at Chicago, but the difficulties of carrying them into execution were far greater, in consequence of the quicksands, drift, and gas encountered in an ancient submerged river-bed intercepting the line of the aqueduct, making several changes of direction necessary.

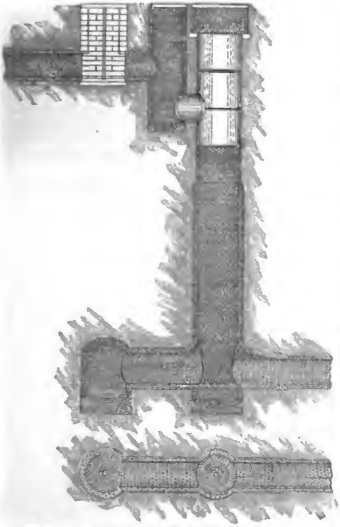


Fig. 10.—Details at Shore End, Cleveland Aqueduct.

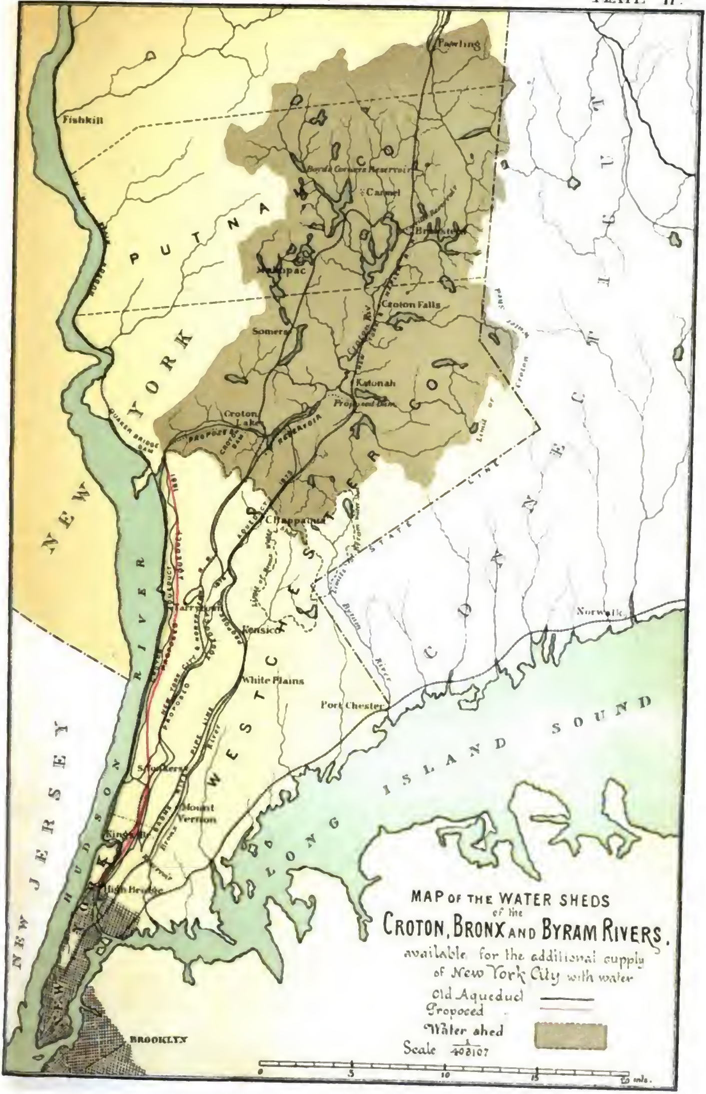
The Aqueduct to Supply the City of Baltimore with Water from the Great Falls of the Gunpowder River was begun in 1875. It embraces the following works: Loch Raven, the storage lake in the bed of the Gunpowder Falls; the tunnel from the dam to the receiving reservoir, Lake Montebello; Lake Clifton, a storage reservoir; and the 40-inch pipe mains from Lake Clifton to the city limits. Loch Raven is formed by a dam of heavy rubble and cut stone across the falls, near Mine Bank Run. Its water-surface is 170 feet above tide; its capacity, 510,000,000 gallons; area, 252 acres; depth, from 4 to 20 feet; length, 4¾ miles; and width, from 100 to 800 feet. The water was admitted Sept. 23, 1881. The conduit is a tunnel 7 miles in length, having an internal diameter of 12 feet, extending from the dam of Loch Raven to Lake Montebello. The grade is 1 foot per mile, and its capacity of discharge will be 170,000,000 gallons in twenty-four hours. Of the entire length, only 2 miles required to be lined with a brick arch. Fifteen shafts were opened during the five years of construction, but these are now securely arched over and filled up. This work was taken as the basis for the estimate upon the proposed new Croton aqueduct (*q. v., seq.*). Lake Montebello, the receiving reservoir, is at the southern end of the tunnel; it is irregular in shape and covers an area of 60 acres. It is 30 feet deep, and has a capacity of 500,000,000 gallons. Its surface is 163 feet above tide, or 7 feet below that of Loch Raven. It is formed in a ravine by building two transverse embankments 80 feet wide at top, and having slopes on the exterior of 2 to 1, or ½, and on the interior of 4 to 1, or ¼. The material taken from the sides and bottom formed the embankments. The surface-drainage that formerly passed through the ravine is now conveyed around the reservoir by a 9-foot tunnel and by sewer-pipes. The gate-house, of white marble, contains twenty-nine 3 by 4 feet iron gates. Lake Clifton, the distributing reservoir, which covers an area of 30 acres, is located one mile south of Lake Montebello. Its capacity is 265,000,000 gallons. Level of water, 163 feet, or same as in the receiving reservoir. From the gate-chambers of Lake Clifton six 40-inch cast-iron mains will convey the water to various parts of the city. The cost of these works from Jan. 1, 1875, to Aug. 31, 1881, was $4,091,375.60. They were constructed under the supervision of Robert K. Martin, C. E., upon plans designed by Alfred Duval, C. E., as early as March of 1854.

New Croton Aqueduct (Plate II.).—The present aqueduct for supplying the city of New York with water was begun in 1837 and completed in 1842, and the High Bridge over Harlem River was completed in 1848. So rapid has been the growth of the city, and so great the demand for water for manufacturing and other purposes, that already the old works, with a capacity of 60,000,000 to 70,000,000 gallons daily, are found to be inadequate, and surveys and estimates have been prepared by Mr. H. O. Thompson, commissioner of public works, and Isaac Newton, C. E., chief engineer, to increase the supply. It is recommended to construct a dam on the Croton basin at a site known as Quaker Bridge, four and a half miles below the present structure, and to a height of 185 feet, being about 25 feet higher than the celebrated dam at Furens in France, which is believed to be the largest in the world. The Croton dam will form a reservoir of 3635 acres in area, with a storage capacity of 32,000,000,000 gallons above the level of the proposed aqueduct. The drainage-area will be 361 square miles. The dam is estimated to cost $4,000,000, being at the rate of $125 per 1,000,000 gallons capacity. The conduit from Quaker Bridge dam to the Harlem River at High Bridge is to be a masonry aqueduct, circular in shape, 12 feet internal diameter, and capable of delivering 250,000,000 gallons of water per diem. The Harlem River and Manhattan valleys are to be crossed by syphons, and the remainder of the conduit between Harlem River and Central Park reservoir is to be in tunnel wherever possible. The distance from the dam at Quaker Bridge to the Harlem is only 26¼ miles, or only $\frac{9}{100}$ of a mile (·0035 per cent.) greater than the air-line, and is almost entirely in rock tunnel, a portion of which, it is thought, may not need lining. This location will therefore secure the greatest possible strength and stability to the structure, with the least cost for construction, supervision, and maintenance. There will be thirty-three shafts of 101 feet average depth. The grade of the conduit will be 9 inches per mile, the crest of the dam being 200 feet above the datum plane, the mouth of the conduit 142 feet, thus permitting 52 feet of storage to be drawn; and the discharge at Central Park, 119 feet above the same datum, giving a total fall of 23 feet in about 29 miles. This new line will have sufficient capacity to supply a population of 2,500,000 at the rate of 100 gallons daily *per capita*, or 3,300,000 people at the present rate of consumption (75 gallons daily). If the capacity of the present aqueduct—viz., 100,000,000 gallons per day—be added, which can be done by tapping the Housatonic or other proposed sources auxiliary to the Croton, the supply may be increased to meet the demands of a population of 4,660,000 at the present rate of consumption. The total cost of this work, including dam, reservoir, and aqueduct, with liberal allowances for contingencies, is estimated to be from fifteen to eighteen millions of dollars. (L. M. H.)

ARABI PASHA, Ahmed El, an Egyptian soldier and revolutionist, was born of peasant parents in the province of Charkieh, in Lower Egypt, about 1837. He entered the army at an early age, and owed his first promotion to Said Pasha's preference for native Egyptians as officers. Having been dismissed from the service for some reason, he became a student at the great Mohammedan college of Azhar in Cairo, and his talents secured him a high reputation as a master of Moslem learning. In 1863, when Ismail Pasha became the ruler of Egypt, Arabi was restored to the army, and exerted all his growing influence to secure to the officers the right of trial before dismissal, and to exclude Turks from military and civil office in Egypt. In 1876 he was employed in the war against the Abyssinians, taking charge of the transport department, but not, it is said, with marked success. Afterwards he was employed in connection with the khedive's sugar-factories in Upper Egypt. On his return to Cairo he resumed his place in the army as a lieutenant-colonel.

The discontent among the people and the soldiery with the foreigners who had been placed in control of Egyptian finances, and with the subordinates—commonly Turks and Circassians—who were entrusted with the collection of the enormous taxation needed to pay the interest on the debt, had reached a great height, when Arabi took a leading part in organizing a national movement for resistance. Through the influence of the English and French bondholders on the course of diplomacy the sultan deposed Ismail Pasha in favor of his son, Tewfik Pasha, who gave the finances into the control of English and French commissioners. This arrangement was made by a decree of the khedive, and was not an international agreement of any sort. This joint Control reduced the principal of the debt, dismissed five-sixths of the army, assumed control of all incomes and outlays, and filled the important and profitable offices with European officials. Although a considerable reduction of taxation was effected, and the methods of collection were humanized, the discontent of the people rather increased than diminished. The army became the organ of this dissatisfaction, demanding an increase of its numbers and its pay. As Arabi was recognized as its leader, he and his regiment were ordered to leave Alexandria. On his refusal to go, his trial by court-martial was attempted, but this resulted in an uprising of the soldiery which forced the dismissal of the ministry and the formation of a commission to investigate the grievances of the army, Arabi being a member. When Riaz Pasha resisted the execution of the proposals of this commission, his deposition was secured (Sept. 9, 1881) by surrounding the khedive's palace by a large body of troops. A ministry in complete harmony with Arabi's policy was appointed, his own title was changed from Arabi Bey to Arabi Pasha, and promotions were distributed freely among his partisans.

Arabi Pasha and his friends demanded the establishment of constitutional government in Egypt. A chamber of notables was convoked, which proved to be in agreement with the army, as were indeed the people generally. The efforts of this body to secure the management of so much of the budget as did not relate to the service of the foreign debt were regarded as the first step to the abolition of the English-French Control, and led to diplomatic collision. At the same time disputes arose as to the punishment of certain Circassian officers who had been convicted of conspiring against Arabi Pasha's life, and whose death-sentences had been commuted by the khedive at the instance of the Control. English and French iron-clads were ordered to Alexandria, and the removal of both Arabi Pasha and the ministry under his friend Mahmoud Pasha Sami was demanded. A chance quarrel in the streets of Alexandria between an Arab and a Maltese led to a massacre of Europeans, several foreign consuls being wounded. Arabi left Cairo for Alexandria, which he began to fortify with earthworks from attacks by sea. His refusal to surrender these forts led to a bombardment of the city (July 11) by the English fleet, and Arabi withdrew with his troops under the cover of a white flag, leaving the city in flames. England now pursued the war against the virtual and only popular ruler of Egypt, France declining to take part. It ended with the successful attack on the earthworks at Tel el Kebir (Sept. 13), and two days later Sir Garnet Wolseley entered Cairo, where Arabi Pasha was arrested. The accession


MAP OF THE WATER SHEDS of the CROTON, BRONX AND BYRAM RIVERS, available for the additional supply of New York City with water
Old Aqueduct
Proposed
Water shed
Scale 1/403107
0
5
10
15
20 mls.
PUTNAM CO
NEW YORK
WESTCHESTER CO
NEW JERSEY
CONNECTICUT
HUDSON RIVER
LONG ISLAND SOUND
Fishkill
Pawling
Boyds Corners Reservoir
Carmel
Brewster
Mahopac
Croton Falls
Somers
Katonah
Proposed Dam
Croton Lake
Croton Dam
Quaker Bridge Dam
Chappaqua
Tarrytown
Kensico
White Plains
Port Chester
Norwalk
Yonkers
Mount Vernon
Kingsbridge
High Bridge
BROOKLYN
Croton Rv.
Bronx River
Byram River
STATE LINE
Limit of Croton
Limit of Bronx

of his enemies to power was signalized by his prosecution on the charge of treason, but, having secured British counsel and the possession of his papers, he prepared for a defence in which he would have shown that he acted under the sanction of the sultan and the khedive. Lord Dufferin, the British ambassador to the Porte, took up his residence at Alexandria, and effected an arrangement by which Arabi Pasha (Dec. 3) pleaded guilty, on the understanding that his sentence should be commuted to exile on full pay. Ceylon was selected as his place of exile, and he departed for this place with six of his chief followers, Dec., 1882.

ARAGO, ÉTIENNE, a French journalist and dramatic author, brother of the great savant D. F. Arago, was born at Perpignan, Feb. 9, 1802. He studied at the colleges of Perpignan and Sorèze, and under the Restoration held an appointment in the Polytechnic School, which he resigned to devote himself to authorship. He composed, chiefly in company with others, more than a hundred vaudevilles and melodramas, some of which exhibited considerable satiric talent, yet have not survived the circumstances which called them forth. In 1829 he became director of the Théâtre du Vaudeville, but closed its doors July 27, 1830, thus giving a signal for the Revolution of July, in which he was an aide to La Fayette. He also took part in the insurrection of 1834, yet escaped the punishment which fell upon some of his associates. In 1840 the theatre, which had still remained under his management, was destroyed by fire, and he was removed from his position. He had been editor of more than one journal, and had published in the *Siècle* several novels signed with pseudonyms. In 1851 he aided in establishing a journal called *La Réforme*, of which he continued political editor and theatrical critic until 1848, and in which he published his historical romance of *Les Bleus et les Blancs*, a picturesque tableau of the Vendean War. His comedy *Les trois Aristocraties*, which appeared in 1847, is the most notable of his productions. From February to December, 1848, he was director-general of the post-office, a place which he filled with vigor and ability, his principal reform being the introduction of the cheap postal system into France. After the Revolution of 1848, he, as a member of the National Assembly, opposed the policy of Louis Napoleon, and signed the act of accusation against the President and his ministers on the occasion of the siege of Rome. He failed of reelection to the Assembly, and in June, 1849, took command of some troops in an insurrection against the Government. The court of Versailles condemned him to transportation, but he had already sought refuge in Belgium. Here he organized a society for the relief of poor emigrants, and waged a literary war against Louis Napoleon, who had become emperor. At the instance of the latter, Arago was expelled from Belgium, and after brief sojourns in England and Holland he finally took up his residence at Turin. Here he resumed his literary labors, and published his *Souvenirs*. The amnesty of 1859 permitted him to return to Paris, where he devoted himself to journalism, and in 1865 he became theatrical critic to the *Avenir National*. After the proclamation of the Republic in 1870, he was made mayor of Paris, which post he resigned in November when he was nominated commissioner-general of the Paris mint. This office he refused, as being a sinecure. In Feb., 1871, he was elected a member of the National Assembly, but soon resigned on account of his age. In Feb., 1878, he was nominated keeper of the records of the School of Fine Arts. In addition to his numerous comedies he is the author of the following works: *Spa, son Origine, son Histoire, ses Eaux, ses Environs et ses Jeux*, a poem in seven cantos (Brussels, 1851); *Une Voix de l'Exil* (Geneva, 1860); *Les Postes en 1848* (1867); and *L'Hôtel-de-Ville au 4 septembre et pendant le Siège* (1874).

ARAMIDÆ (etym. unknown), a family of marsh-birds, furnishing a connecting link between the cranes (*Gruidæ*) and the rails (*Rallidæ*). It consists of the single genus *Aramus*, of one or two species, inhabiting the warmer parts of America. The osteological and pterylographic characters are completely crane-like; the digestive system is as in the rails; cœca coli two; carotids two; syringeal muscles one pair; femoro-caudal muscle absent. Bill longer than head, slender but strong, deeply grooved, contracted opposite the nostrils, the terminal portion enlarged and decurved; nostrils long, linear, pervious; head completely feathered to the bill; tibiæ bare below; tarsus as long as the bill, and scutellate anteriorly; toes cleft, the hinder short, elevated; wings short, rounded, with falcate first primary; tail of twelve short broad feathers. The North American species (*Aramus pictus*, Coues), inhabiting the marshes of Florida, is known as the crying-bird, carau, or limpkin; it is chocolate-brown, with an olive shade, most of the plumage sharply streaked with white; length about two feet. (E. C.)

ARANY JANOS (1817–1882), a Hungarian poet, was born at Nagy-Szalonta, March 2, 1817. He was the son of a poor Protestant, and was educated at the College of Debreczyn. At the age of seventeen his desire for adventure led him to join a company of strolling players, with whom he remained for some years. Domestic troubles brought him back to Szalonta, where he became a teacher of Latin in the Protestant school, and in 1840 was appointed second notary of the town. In 1843 the Kisfaludy Society offered a prize for the best popular narrative poem, and Arany's first attempt, which was presented anonymously, obtained the honor. The poem, *Az Elveszett Álkotmany* ("The Lost Constitution"), set forth with much humor the intrigues of candidates for the assembly. His second poem, *Toldi* (1847), obtained a similar prize and had still greater success. It comprises twelve cantos, and the author afterwards made it the first part of an epic trilogy. Toldi is the Samson of Hungarian folk-lore, and his exploits, assigned by some to the reign of Louis the Great, about A. D. 1370, and by others to that of Matthias Corvinus, a century later, had been poetically treated by Peter Ilosvai in 1574. Arany's *Toldi* is a truly national poem both in subject and in treatment, and exhibits masterly skill in the delineation of character as well as in composition. The Kisfaludy Society in 1848 offered prizes for poems on the capture of Murany, and Arany's poem *Murány ostroma* obtained the second prize. During the Revolution of 1848, Arany held a position under the minister Szemere, but after the overthrow of Kossuth retired to his birthplace, where he remained unmolested. In 1854 he was appointed professor of Hungarian literature in the Protestant school at Nagy-Körös, and in 1860 he removed to Pesth, where he became director of the Kisfaludy Society and edited the *Koszorú* ("Crown"), a literary weekly periodical. In 1858 he had been elected a member of the Hungarian Academy, and upon the death of the historian Szalay was made secretary, but in 1878 was compelled to resign the position. Besides the poems already mentioned Arany has published—*Katalin* (1850); *The Gypsies of Gross-Ida* (1852); *Toldi's Evening of Life* (1854), the concluding part of the Toldi trilogy; *Buda Halàla* ("The Death of Buda," 1864), a legend of the Huns; and *Toldi's Love* (1880), which forms the second part of the trilogy. A collected edition of his poems appeared at Pesth in 1867, and in 1879 his prose writings were also collected. The latter comprise studies of the ancient Hungarian poets and criticisms on other literatures. Arany has enriched his native language with translations from Tasso, Goethe, Shakespeare, and Aristophanes. Selections from his poems have been translated into German by Kertbeny (Geneva, 1860), and by Dux (Pesth, 1861). He died in October, 1882.

His only son, ARANY LASZLO, was born at Nagy-Szalonta, March 24, 1844. He has followed in his father's footsteps, translating from Shakespeare and Molière, making collections of popular tales and songs, and composing original poems. Of the latter the most important are—*Elfride*, a narrative poem; *The Slaughter of the Huns*, a poetical treatment of the contest between the Germans and the Magyars; and *A délibábok höse* ("The Hero of the Dream," 1873), a satirical poem.

ARAPAHOES, a tribe of American Indians who formerly resided near the head-waters of the Arkansas and Platte rivers. The native name of the tribe is *Atsini*. They belong to the Algonkin family. In disposition they are fierce, thievish, and treacherous; in habits nomadic and warlike; in person tall and gaunt, bold and independent in expression. Their numbers have been rapidly decreasing. In 1822 they were estimated at 10,000, of whom less than 3000 remain. War and the ravages of the small-pox have caused this decrease. They were long in close bonds of alliance with the Sioux and Cheyennes, and joined with them in many incursions upon the Utes and in assaults upon the border settlements. In 1867 they were mingled with both bands of the Cheyennes and joined in the wars of the latter. Ill-treatment by immigrants, injudicious actions of the military, and unwise delay of the Government in providing them with a reservation aroused distrust and anger. They could obtain food only by hunting, and at this juncture the sale of arms and ammunition was forbidden, almost forcing the destitute Indians to war. The treaties made in 1867 were disregarded. Depredations on the settlements took place, many settlers were killed, and much property was destroyed. After some hard fighting the Arapahoes, in common with the Cheyennes, were put down in the winter of 1868. They are now, to the number of nearly 2000, on a large reservation in the Indian Territory, which they share with the Cheyennes. Here they show some indication of a change of habits. The northern band is on a reservation in Wyoming Territory. (C. M.)

ARBITRATION (Latin *arbitratio*), a submission by the parties to a controversy of the matter in dispute to the judgment of two or more persons, called arbitrators, whose decision binds both parties with the same force as a judgment or decree of a court of justice. The object is to avoid the delay and expense of litigation, as well as to secure an impartial and intelligent judgment at the hands of persons skilled in the questions arising in the controversy. At the present day its principal use is in the settlement of mercantile controversies, especially in cases where practical questions of business are involved. Arbitration has always been favored by the law as a means of speedy and inexpensive settlement of disputed questions. In the civil law it occupied an important place (the eighth section of the 4th book of the Pandects being devoted to it), and from this source is has become generally adopted in the countries of continental Europe. In England it was made the subject of statutory enactment by stat. 9 and 10 Will. III. c. 15 and 3 and 4 Will. IV. c. 42, and by subsequent legislation, more particularly the Common Law Procedure Act of 1854, many important provisions have been made in regard to it. In Scotland the principles and practice of arbitration have been taken from the civil law without the intervention of any statutes. In our own country we have largely followed in this respect the ideas and practice derived from England, and, with the large increase of trade and commerce, and the extended inter-communication between the different States in mercantile transactions, the tendency is towards a more general adoption of voluntary arbitration as a means of settling disputed claims. Many of the boards of trade and other mercantile associations have established especial tribunals for the arbitration of controversies arising from transactions between their members, and in nearly all the States of the Union statutory provision is made for the regulation of litigated cases submitted to arbitration by consent of the parties. In the State of Pennsylvania (excepting the city of Philadelphia) there is a peculiar provision for *compulsory* arbitration, by which, with the consent of either one of the parties, the subject-matter of a suit may be referred to arbitrators for decision. This is similar in its provisions to the Roman law, by which the prætor selected from a list of citizens made for the purpose one or more persons, who were authorized to decide all cases brought before them. In practice, arbitration is arranged by an agreement between the parties, generally in writing, which is called the *submission*. Usually the submission is made in the first instance to two persons, one chosen by each party, with the provision that in case of the failure of the two to agree they shall choose a third, and that the decision of a majority of the three shall be final. This decision is called the *award*, and, according to the terms of the agreement of reference, becomes either a final decision of the whole matter submitted, or else is entered as a judgment in a court of record, with the same effect as if entered upon the verdict of a jury or a decree of the court. (S. W.)

See Vol. II. p. 273 Am. ed. (p. 311 Edin. ed.).

ARBOR VITÆ. *Thuja occidentalis* is the common Arbor Vitæ of literature, or, popularly, the "American Arbor Vitæ," as it was the only species known until the early part of this century, when another species was discovered on the northern shores of the Pacific coast and named by Nuttall *Thuja gigantea*, from its growing much taller than its Eastern relative. The Eastern species is often known as "White Cedar," though another tree, *Cupressus thyoides*, is "White Cedar" in New Jersey, and has a prior claim to the name. The Western one is known as the Oregon White Cedar, or Arbor Vitæ. *Thuya*, or *Thuja*, is the Greek name of a tree referred to by Theophrastus as having had fragrant wood which was often used as incense. This may have been the savin, *Juniperus Sabina*, and the botanists of the sixteenth century supposed this American plant to be related to it. It had become so well known as Thuja that the name was adopted by Tournefort at the reorganization of botanical science in the beginning of this century. The "American Arbor Vitæ" was probably the first plant of this continent to be known to Europeans. Francis I. of France sent an expedition under Jacques Cartier in search of a western road to India. The story of his landing on the St. Lawrence and wintering up the St. Charles River is well known. During the winter the scurvy made sad havoc among his followers. There was little hope for a single life. A friendly Indian taught them how to make the *annedda*, one of their famous medicines, by the use of which every one still living recovered. This is most likely to have been made from the American Arbor Vitæ. Rafinesque, in his *Medical Flora*, notes that it is a famous Indian remedy for scurvy, rheumatism, and similar complaints. They make an ointment of the fresh leaves with bear's fat, and use a decoction of the leaves internally. To Cartier's band the tree was a veritable *arbor vitæ*.

See Vol. II. p. 275 Am. ed. (p. 313 Edin. ed.).

The Arbor Vitæ has its chief home on the line of the great lakes, the Eastern form extending southwardly along the Alleghanies by a few scattered specimens to the Potomac River, and gradually getting scarcer towards the Saskatchewan, where it meets its relative from the West. Though it is found in swamps often of immense extent, the innumerable fibres or feeding-roots are rather in the cool moist air of the coarse moss than in the water. It has not been found to grow in permanently wet ground. It loves to grow on rocks only when the situation is cool. In rich earth it grows well. One tree fifteen years old, cut down by the writer, measured 10 inches across. Some trees have been reported 3 feet in diameter and 60 feet high; the usual figures are about half of these. The Eastern species makes remarkably durable posts; some have been known to be in use 40 years. Some rails have been 50 years in service. The wood is as light and soft as white pine, and is adapted to many uses in household work. It is used extensively on some Eastern railroads for sleepers, though it is reported not to hold nails well. The Western form, from its much larger growth, makes a valuable timber-tree. It is not perfectly hardy in the East, but large quantities are used in German forestry. It is very abundant in Washington Territory and Oregon. The Arbor Vitæ is one of the most valuable trees in American gardening. It is not only employed as single specimens in ornamental grounds, but it is used as hedges, screens, and wind-breaks for gardens and orchards. (T. M.)

ARBUTUS. In Europe, *Arbutus Unedo*, commonly known as the "strawberry tree," is generally understood as the "Arbutus tree." In America, "Menzies' strawberry tree" is *Arbutus Menziesii*, and "the trailing Arbutus" is *Epigæa repens*, which was regarded as a true arbutus by the early Virginian botanists, and has managed to retain the primitive name in botany as a common appellation, though removed to another genus. They both belong to the *Ericaceæ*, but the Arbutus, as now understood, is limited to those with fleshy fruit, while the trailing Arbutus bears its seed in dry capsules.

The Arbutus of the ancients is the *Unedo*. Its fruit is as large as a fair-sized strawberry, and has a similar color. It is in great favor with birds. The ancients, as is evident from Virgil and other poets, pronounced arbutus with the accent on the first syllable, but modern usage, sanctioned by Webster, places it on the second. It is a native of the south of Europe, abounding especially in the mountains of Spain, and has been found as far north as the Lakes of Killarney in Ireland. The American species, *Arbutus Menziesii*, is a native of the Pacific coast, ranging from Puget's Sound coastwise through the Californian mountains, where it receives the common name of *madrona*. It is popular from its beauty alone, for the fruit is even less desirable than that of its European relative. It is a tall, slender tree, not reaching more than one or two feet in diameter, though growing forty or more feet high according to Nuttall, or one hundred according to Asa Gray. A small form, reaching about twenty-five feet high, extends to Texas, and other species are found in Mexico.

Epigæa repens, besides "trailing Arbutus," is known as "ground laurel" and "Mayflower,"—the last chiefly from the poetical association of the name of the vessel which brought the Pilgrims to Plymouth Rock. It is among the earliest spring flowers, and is found in shady woods from Canada southward, though not extending beyond the Mississippi. It is of great interest to botanists, being one of the few *Ericaceæ* with bisexual flowers. (T. M.)

ARCANI DISCIPLINA, or the "Discipline of the Secret," is a term having reference to the outward relations of the primitive Church towards the unbaptized. It denotes a reticence regarding the faith, the sacraments, and the religious practices of the early Christians. It prevailed from the middle of the second century, until after the conversion of Constantine, and even till the sixth century, when secrecy or reserve in such matters became unnecessary or impossible. The principal reasons for the Discipline of the Secret were to protect from derision and the profanation of heathens the mysteries and sacraments of religion, and to smooth the way to a reasonable acceptance of the sublimer and more difficult doctrines of the faith by imparting a knowledge of them by degrees and in methods adapted to the mental capacity of those under instruction. Among early Christian writers, Tertullian is the first to affirm in unmistakable terms the existence of this religious reticence, and to insist upon the distinction made between the catechumens and the faithful. The doctrines of the Trinity and of the Eucharist were guarded more jealously than other parts of the Church's teaching, but even touching these the Discipline of the Secret was relaxed where necessity or the good of religion required it; hence we find that the whole truth, regardless of the feelings of the weak or of the possible derision to which the sublimer mysteries would be exposed, is stated in the Apologies written during the ages of persecution under the Roman empire. The symbolism which pervades every department of Christian art is founded upon the strict observance of this salutary Discipline of the Secret.

In the early Church the practice of excluding the catechumens from the more important parts of divine worship went so far that officers were appointed to bolt and bar the doors during the celebration of the sacraments, and even at times it was deemed unlawful to announce to any except the faithful the time and place of holding the principal services. It is remarkable that the Greek Church, which has no catechumens, retains the use of the ancient formulas by which that class were dismissed from public worship. In some Protestant denominations or in particular congregations the general audience is dismissed before the Lord's Supper is administered, but this practice may have arisen from other reasons than those which occasioned the ancient *Arcani Disciplina*. Thus, in the Scotch Kirk formerly all persons of immature age, although members of the church by baptism, were excluded from the communion service proper. Among the Plymouth Brethren the weekly "breaking of bread" is in the presence of the brethren only.

The term was used first by the French Protestant theologian Jean Daillé (1594–1670), though the practice had already been pointed out by other controversialists of the seventeenth century. The Jesuit Schelstrate accepted the term in his *Antiquitas Illustrata* (Antwerp, 1678), and it has since been in common use. From the Catholic point of view the practice has been fully discussed by Schollner (1756), Döllinger (1826), Lienhardt (1829), Hefele (1846), and Mayer (1868). The Protestant view is shown by Bingham in his *Origines Ecclesiasticæ* (1708–22), Richard Rothe (1841), Harnack (1854), Zezschwitz (1863), and Bonwetsch (1873).

ARCH, JOSEPH, an English social and political agitator, was born at Barford, Warwickshire, in 1826. His father, though very poor, was the owner of a small freehold with a cottage. Joseph was sent to school from the age of six till nine, when he was hired out to a farmer. He became a good hedger, and, having married in early life, travelled around to get a living. He thus acquired a thorough knowledge of agricultural life, and his earnest religious feeling led him to become a local preacher among the Primitive Methodists. On account of his reputation as a strong and fluent speaker he was invited to address a meeting of agricultural laborers at Wellesbourne, Warwickshire, Feb. 7, 1872, and a report of his speech appeared in a local paper. Other meetings were held in neighboring villages, and soon the movement attracted general notice. Joseph Arch was the principal speaker, and was accepted by the people as their leader. In spite of opposition from landlords and farmers an agricultural laborers' union was formed, and Mr. Arch was made its president. A national congress was called to meet in May, and a newspaper called *The Laborers' Union Chronicle* was started by Mr. George Vincent, who had published the account of the first meeting. Mr. Arch then began an extensive tour, addressing eight or ten meetings each week, often in the open air, and discussing all the rights and grievances of the laboring classes. Having been a strenuous advocate of emigration, he visited in 1873 both the United States and Canada, that he might facilitate a movement for that purpose. Large meetings were held in the Eastern American cities to hear and welcome him, while invitations were sent to him to visit more remote places. He soon returned to carry on the work of agitation, and as a result the wages of farm-laborers have been substantially increased, their hours of toil diminished, while thousands have been assisted to emigrate. The funds of the union were increased by contributions from all classes. When a sharp controversy arose among the leaders of the movement—for some opposed the policy of emigration—Mr. Arch retained the confidence and respect of all. Harmony has since been restored, and the numbers and power of the society have steadily increased. In connection with the union a sick-relief society has been formed, which during the years 1876–82 paid out over £20,000.

ARCHÆOLOGY (AMERICAN).

See Vol. II. p. 291 Am. ed. (p. 333 Edin. ed.).

THE archæology of America approaches to a more recent date than that of the Old World. It is held to include all that concerns the natives of our continent previous to its discovery and exploration by Europeans, in the sixteenth century. All that was antecedent to this event was essentially "prehistoric," for although it is true that a few American nations possessed historical traditions, and even written chronicles, carrying the records of their existence back some centuries, yet these were so brief, so vague, and hence reached us in such a fragmentary condition, that they do not merit the name of history.

ANTIQUITY OF MAN IN AMERICA.

While we thus have the date nearest us fixed with an accuracy that is not possible in European archæology, a greater uncertainty than in Europe prevails as to the antiquity of the race on our soil. The "origin of the Indians" is a question which has been debated ever since America was discovered, and there is hardly a possible hypothesis which has not found its advocates. Early in this century Alexander von Humboldt pronounced it a question which does not come within the scope of scientific inquiry; and in the manner in which it is usually prosecuted this is true. But the discovery in Europe of remains of human art in deposits of the late Tertiary or early Quaternary period has endowed the subject with a new and a legitimate interest. Numerous careful researches have been made in the corresponding geologic strata in America to discover such relics here. These have not been fruitless. As early as 1838, Dr. Lund found human remains associated with those of extinct animals in the caves of Brazil. In the United States there is no reasonable doubt that men were living in the Mississippi Valley when the mastodon and the elephant browsed in its forests, and in New Jersey when the Greenland reindeer and the walrus were at least occasional visitors. But, though these and similar facts be accepted, they furnish no positive evidence of hoar antiquity. It is quite possible that these animals became extinct in these localities at a comparatively recent epoch—say two or three thousand years ago. Much more decided testimony must be forthcoming to prove for man an age which might be called palæontologic. The auriferous gravels of California show a commingling of the relics of man and extinct animals, and the loess which covers the ancient lake-beds of Nebraska furnishes rude arrow- and spear-points sometimes at a depth of fifteen or twenty feet below the surface of the soil, and in intimate association with bones of the early American elephant (*Elephas Americanus*). But here, again, we are foiled by the lack of elements to decide positively the age of these deposits. Probably the most conclusive evidence in North America is that found in the Trenton gravel, on the Delaware River above Philadelphia. These have been most carefully studied by both geologists and antiquaries. They unquestionably contain rude stone implements in original sites; and these traces of men cannot be dissociated from a time when essentially glacial conditions prevailed in the upper valley of the Delaware (Dr. C. C. Abbott, *Primitive Industry*, 1881). In South America, on the Rio de la Plata and the Pampas of Buenos Ayres, Mr. Florentino Ameghino has collected a large number of observations showing that relics of human industry are found in close connection with fossil remains assigned to the early Quaternary (*El Hombre Cuatenario en la Pampa*, 1880, and *Antigüedades de la Banda Oriental*, 1877). Other facts, such as the extended cultivation of maize and the diversity of languages, go to show that no recent date can be assigned to the presence of man on this continent. Certainly, the duration of his residence here must be counted not by thousands, but by tens of thousands, of years, if not generations.

RELICS OF THE HUNTING TRIBES OF THE UNITED STATES.

At the time of the discovery nearly the whole present area of the United States was occupied by tribes who depended mainly on hunting for subsistence. Their habitations were not fixed, and both the early accounts and the relics of them preserved place them in the "Neolithic age," or in that stage of advancement where stone is the substance in general use, and its management has arrived at considerable perfection. We attribute to these tribes those numerous relics in stone, bone, and pottery which can be found almost anywhere in our country. Those in stone are principally arrow- and spear-points, axes, hammers, chisels, mortars, pestles, knives, sinkers, scrapers, agricultural implements, gorgets, and discoidal stones. The uses of these are not always certainly known, and the names applied to them are provisional. The pottery found is generally of rude workmanship, and is unglazed. It was made by pounding shells and mixing the fragments with moistened clay; after sun-drying the vessels were baked in an oven or open fire. Moulding was secured by the hand or by the use of a basket; the potter's wheel was not known. In almost every place, however, some attempt at ornamentation is visible, either by rudely-inscribed set figures, by drawings of animals, or by painting. The forms are not unfrequently odd, and occasionally are graceful. Bones and shells were employed to make awls and for ornament. The wampum was of shells, and resembles rude beads. Arranged on strings, it served as a means of counting, as a currency, and as a decoration. Basket-work and the manufacture of mats woven from strips of bark were arts also widely known, specimens of which are in most collections. These tribes left no other traces of their existence, except, indeed, their "kitchen-middens," or refuse shell-heaps, on the shores of the large rivers and bays, and their tombs. The latter were generally communal, and led by gradual accretions to the erection of mounds filled with the bones of the dead.

THE MOUND-BUILDERS.

When the upper Mississippi Valley was first explored it was peopled by much the same race of savages found east of the Alleghanies. But when it became settled the relics of a race were discovered there who evidently occupied a plane of civilization comparatively much higher. These relics consisted of lofty mounds raised by hand, of extensive embankments, of broad and deep ditches, of angular and terraced pyramids, and of a fine variety of stone implements and pottery. The most complete examination of these remains was that of Messrs. E. G. Squier and E. H. Davis (*Ancient Monuments of the Mississippi Valley*, 1848). They divided them into two general classes, Enclosures and Mounds. The enclosures were usually for defence, as was evident from their character and position. Some of the mounds were places of sepulture, others were sites of buildings, and still others were intended for defence, for look-outs, for sacrificial purposes, etc. The average size of an enclosure is about 50 acres. At Clark's Works, Ohio, the embankment is three miles long. Sometimes the enclosure is circular, or the bank may represent the sinuous form of a serpent. The mounds are of very various heights. That at Grave Creek, on the Ohio, was 70 feet high, and was distinctly a sepulchral mound; one at Miamisburg, Ohio, was 68 feet high, and was estimated to contain over 311,000 cubic feet of earth; far larger was the truncated pyramid near Cahokia, Ill., which has a base-area of 500×700 feet, with an altitude of 90 feet, but it is not certain that it is wholly artificial. The relics discovered which were peculiar to the ancient builders were articles of pottery of graceful forms, knives and ornaments hammered from native copper, fragments of hammered silver, mica from North Carolina, knives of obsidian, pearls from the Southern rivers, sculptured pipes wrought with great delicacy and spirit, marine shells, and implements of polished stone. Several of these clearly pointed to communication by commerce or otherwise with tribes living to the south, and even with some in Mexico. Countless hypotheses have been framed to explain "who were the Mound-builders." The simplest is the best. When De Soto marched through the area of the present Gulf States, he found the territory peopled by tribes who erected and used just such mounds as we find in the Ohio Valley. Their stage of culture was just about that of the Mound-builders, and their existing remains strongly resemble those found north of them (C. C. Jones, *Antiquities of the Southern Indians*, 1873). These facts confirm ancient traditions of the northern tribes to the effect that the builders of the mounds had been driven southward, and put it beyond reasonable doubt that this mysterious race were the ancestors of the Choctaws, Natchez, Muskokees, and associated tribes. Their dispersion took place probably only a few centuries before the discovery.

A totally different class of remains are the "animal mounds" of Wisconsin. These are low embankments, a few feet in height, which are disposed in the form of some animal (J. A. Lapham, *Antiquities of Wisconsin*, 1853). The turtle, the bird, the lizard, etc., can be recognized. One presents a curious resemblance to an elephant. These were probably "totemic" mounds erected for ceremonial purposes, and need not claim any very high antiquity nor any other authors than the present race of Indians. They have, strangely enough, been paralleled by other animal mounds of ancient date discovered in Algeria; and there have not been wanting theories to show that this resemblance is of historical significance (*Des Monuments symboliques de l'Algérie*, Paris, 1868).

Earthworks in the Gulf States.—Throughout the lower Mississippi Valley, and eastward to the shores of the Atlantic, numerous earthworks of large size are found in the fertile river-bottoms. They include examples of round and quadrilateral mounds, plain and terraced, embankments, canals or moats, "chunk-yards" (which are level spaces surrounded with low walls of earth), and artificial lakes. Not a few of these structures rival in size the most important of the Ohio Valley. Thus, one in the Etowah Valley, Ga., has a cubical capacity of 1,000,000 feet; the "Messier Mound" on the Chattahoochee River contains about 700,000 cubic feet of earth. Quite a number are from 50 to 70 feet in height, with base-areas of about 200×400 feet. These mounds, embankments, and causeways can be traced to the southern extremity of Florida, and indicate that they were all erected by the same people, or, at any rate, by tribes about equal in culture and with similar methods of life. We are not left in doubt as to who they were. As has already been hinted, the first explorers of that region discovered tribes who elevated precisely such mounds for the sites of their principal buildings. They also were agricultural, and on the rich soil of the river-bottoms raised large crops of Indian corn, beans, and pumpkins, with which, aided by natural fruits and game, they were able to support a reasonably dense population. It is also well known who these tribes were. They were precisely the same as those who inhabited that territory when the English formed the colonies of Georgia and South Carolina and the French that of Louisiana. These remains, therefore, become an important standard of comparison in the archæology of the United States.

CLIFF-HOUSES AND PUEBLOS.

Neither in the Mississippi Valley nor east of it can there be fairly said to have been found a single instance of the erection of a stone or brick wall by the native inhabitants; the rude embankments of dry stones do not deserve that name. Mural remains begin with the race that inhabited the present areas of Colorado, New Mexico, and Arizona. In the south-western corner of Colorado the arid table-land is seamed by deep cañons from 500 to 1500 feet in depth, through which the watercourses flow, and which occasionally expand into fertile valleys. The precipitous sides are of sandstone, and often worn into caverns, ledges, and rock-recesses. On such scant and almost inaccessible sites are perched the cliff-houses of the ancient inhabitants (fig. 1). They are of stone well bedded in firm mortar, the walls of accurate angles and true to the plumb-line. The rooms are small, about 7×10 feet or less. Often there are two stories, each about 5 or 6 feet high in the clear. The walls are plastered internally, with occasional attempts at decoration. The sills are of cedar-wood, which is often still in good preservation. In the vicinity of such cliff-dwellings, perched on commanding points of rocks, are the remains of stone towers, both square and round. These were evidently watch-towers, and their small windows, opening to the north and east, indicate that the enemy was expected from those quarters. The age of these towers and cliff-houses, at least of those most recently built and occupied, is probably not more than two centuries. A Spanish account of that region, drawn up at the beginning of the last century, mentions the cliff-houses as at that time occupied.

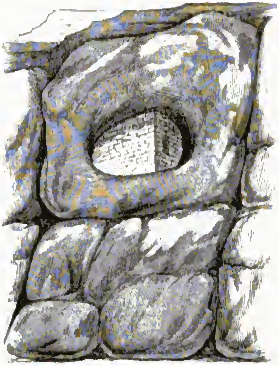


FIG. 1.—Cliff-house, Colorado.

The *pueblos* in New Mexico are large communal structures, three and four stories high, of *adobes* or sun-dried bricks. They are erected by several different tribes having no affinity with each other in language, but who are on nearly the same plane of culture. They are agricultural, manufacture good pottery, and have been stationary for many generations. The *pueblos* are entered from the roof, access to which is obtained by means of ladders against the outer walls. They are usually of large size, that at Casas Grandes, on the San Miguel River, measuring externally 800×250 feet. The ruins of very many such structures are found along the Gila River and its tributaries. They are unique in design and material, no similar edifices being found elsewhere either in the New or the Old World. The supposition that they were the work of the ancient Aztecs has now been abandoned by all scholars.

Rock and Stone Etching.—A class of archæological finds of peculiar interest, as approaching literate records, are the "pictured rocks" and "inscribed stones" which have been found from time to time. So far as these latter are concerned, we may rule out as fraudulent all which pretend to present alphabetic characters, Hebrew or Runic or Phœnician. The "Grave Creek Tablet," the "Newark Stones," etc., illustrate the history of knavery, not of archæology. Pictured rocks, which are more properly etched rocks, are found throughout both North and South America, but not equally distributed. They occur in limited areas, with large tracts between them entirely devoid of such monuments. The figures are of men and animals, scrolls, darts, etc. One very peculiar variety presents cup-shaped and circular depressions; they have been made the subject of a monograph by Prof. C. Rau, who connects them with phallic worship (*Cup-shaped and Other Lapidarian Sculptures in the Old World and in America*, 1881). There is little doubt that most of the pictured rocks are records of events.

The inscribed stones have sometimes simple scratches intersecting each other at various angles; scroll-work in rude arabesque designs; etched outlines of faces, animals, tents; and, as we approach the tropics, elaborate figures with ideograms. To the last-mentioned belong the Mexican *chalchihuitls*, which for convenience may be included here. They are of a variety of jade, and were elaborated with great skill.

Ancient Mining.—The native copper found in the mounds and among the hunting tribes at the epoch of the discovery was obtained from the cupriferous beds on the shores of Lake Superior, where many relics of the ancient exploitations were discovered. The process was very primitive. The rocks were cracked by fires built against them, and were then broken by stone mauls. In North Carolina the natives mined considerable quantities of mica, and their excavations and dump-heaps are frequently discovered. The small quantity of gold they possessed appears to have been obtained by washing from the sands of streams in Northern Georgia. Signs of very ancient operations of the kind have been found there, and the reports of the first explorers relate that the Indians pointed to this region as the source of their few gold ornaments. Pipe-stone, serpentine, flint, and colored clays were also worked to some extent.

Mexico and Central America.

The archæology of these regions is much richer than that of the United States, as the nations that dwelt there had approached much nearer a civilized condition. The late investigations in this domain have been conducted by two different schools of antiquaries. The one, sometimes called "the Prescott school," believe, with this eminent historian, that the accounts of the early Spanish explorers are generally true, somewhat exaggerated indeed, and colored by the formulæ of expression to which they were accustomed, for which due allowance is to be made. Thus, if a head-chief was called an "emperor," we are simply to understand that he was a great and independent ruler. When Cortez says that a hundred thousand Indians helped him to destroy the city of Mexico, the number may be heavily discounted. Nevertheless, the general accuracy of these narratives is received. The other is "the Morgan school," who follow the opinion expressed by the late Lewis H. Morgan, that the Aztecs and Mayas were but little above the northern Iroquois, and their remains must all be explained by what we know of this hunting tribe. These diverse views lead to equally discrepant estimates of the ancient remains. Thus, Mr. Bandelier maintains that the great pyramid of Cholula was "an artificially elevated fortified pueblo," while the other side, backed by the unanimous testimony of the Spanish writers, declare that it was the site of a temple and was constructed primarily for religious purposes.

The principal civilized nations in this region were the Aztecs, Tarascas, and Zapotecs in Mexico, and in Central America the Mayas, Kiches, Chorotegans, and Coibas (Cuevas), the first two of whom were closely related. It is quite likely that the developments of these centres of civilization were largely independent and approximately synchronous. The effort has been frequently made to trace them all to the influence of the "Toltecs," and even the mounds of the Ohio Valley and the colossal stone-work around Lake Titicaca in Peru have been attributed to this same people. The Toltecs, however, on examination, turn out to be a purely mythical conception, and to have no place whatever in history. They are simply a personification of the rays of light, servants and emissaries of the Aztec god of the light and the air, Quetzalcoatl. They are less real than the Knights of the Round Table, and their name should be dismissed from all serious discussions of the pre-Columbian history of America.

Architecture and Sculpture.—The fundamental element of construction throughout Mexico and Central America was the pyramid. It was circular or quadrangular, plain or terraced, of brick, earth, or stone, as the purpose called for. Sometimes it was solid from the ground up, sometimes it enclosed chambers, sepulchral or for the use of the living. These pyramids were the bases of a superstructure of one to three stories, usually of small rooms. In details there is considerable variety. A form of false arch is common in Yucatan. It is simply the approach of two walls by the overlapping of the stones and the closing of the top by a single flat stone. A nearly true trefoil arch is, however, found at Palenque (fig. 2). The pillar is occasionally used, but its architectural elements are rarely developed. The enormous size of many of these structures is capable of two explanations: either they were the results of the labors of a small community extended over generations, or if the product of one autocratic ruler he must have been able to command a very large body of skilled laborers and have had an ample food-supply to draw from. The pyramid of Cholula covers 44 acres, and is about 200 feet in height. The "temple" at Copan is built of heavy blocks of cut stone, with walls about 25 feet in thickness, running to a height of 90 feet. The ground-plan measures 624 × 809 feet. The walls of the "fortress" at Mitla are of stone, 6 feet thick, 18 feet high, and more than a mile in length.

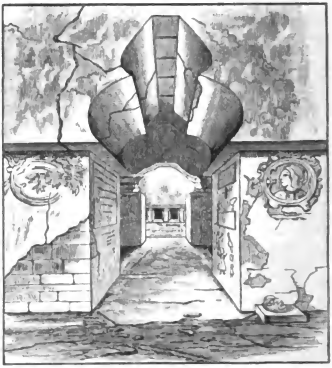


FIG. 2.—Trefoil or "Maya" Arch (from Palenque).

Immense blocks of granite, 16 and 19 feet long, elaborately carved on the surface, appear in the walls of other buildings at this spot. The mere massiveness of such work bears important testimony to the social relations of a people who could control the labor requisite to such gigantic undertakings.

The most elaborate sculpture is seen in the architectural remains of the Maya race. The whole external surface of many of the edifices at Copan, Chichen Itza, Uxmal, and Palenque is one intricate design worked out with infinite toil in a hard limestone rock. When it is remembered that this must have been done chiefly by "pecking" with stone hammers and chisels, we can scarcely estimate the tedious labor it involved. Nor was any effort made to economize this labor. Carefully-worked designs are found which could not have been seen from below, but, if at all, only by one looking from above downward.

Slabs occur in the interior of the temples sculptured in low relief with figures of men and animals and conventional signs used for recording ideas. The famous "Tablet of the Cross" at Palenque, a portion of which is in Washington City, has particularly attracted the attention of students (*The Palenque Tablet in the United States National Museum*, by Charles Rau, 1879). Not less remarkable are the porphyritic monoliths, skilfully filled in cavo-relievo with symbolic groups, which were discovered a few years ago near Santa Lucia Cosumalwhualpa, Guatemala. Although their origin, or even their existence, is not referred to in the history of that country, antiquaries incline to attribute them to some Nahuatl-speaking tribe (that is, of Aztec affinities) who at some remote period settled there (*The Sculptures of Santa Lucia Cosumalwhualpa*, by S. Habel, M. D., 1878; *Die Sculpturen Cosumelhualpas*, A. Bastian, Berlin, 1882). Idols of stone were often mentioned by the early writers, and constantly occur in the existing remains. They are of all sizes, from the figure less than the little finger, intended to be worn attached to a cord around the neck, to such colossal images as the serpents at Chichen Itza, whose heads alone are 10 feet long. Nearly all the larger statues are simply in high relief; that is, they are not entirely detached from the matrix-stone. They frequently indicate that the artist selected a stone the natural form of which approached his ideal; or, rather, that he modified the latter to suit the facilities offered by the shape of his block. Of statues "in the round" much attention has been attracted to one unearthed by Dr. Le Plongeon at Chichen in Yucatan, and by him supposed to be that of a king by name Chac Mool (*Trans. Am. Antiq. Soc.*, 1877) (fig. 3). It represents the reclining figure of a man, naked except for his head-dress, bracelets, anklets of feathers, and sandals. He holds by both hands in the centre of his body a large vase. The total length is 1·55 metres. This statue was seized by the Mexican Government, and taken to the city of Mexico and deposited in the National Museum. That museum contains two others almost its exact counterparts—one found in the plaza of the city of Mexico itself, one in the state of Tlaxcala. The three undoubtedly represent the same divinity, the god of the rains (Jesus Sanchez, *Anales del Museo Nacional*, tom i., 1879).

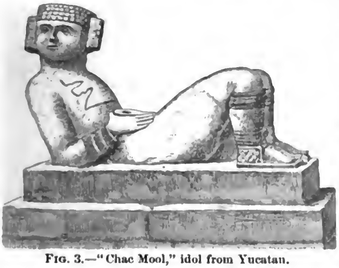


FIG. 3.—"Chac Mool," idol from Yucatan.

Age of the Remains.—The strong desire which one naturally feels to ascertain the age of the vast architectural remains referred to can be gratified only to a limited extent. On the one hand, many of these ruined cities were in good preservation and inhabited by the natives at the time of the Conquest; others were even then in ruins and desolate. The latter is undoubtedly true of Copan, Palenque, Uxmal, and Ho. On the other hand, the ancient Maya chronicles, fragments of which have been preserved, assign distinct dates for the founding of Uxmal, Mayapan, Chichen Itza, and other famous sites, and mention the chiefs or kings who ordered the work. These dates are not of extravagant antiquity; that is, they are all within a thousand years of the epoch of the Conquest, and are such as reasonable observers who have studied the ruins themselves have assigned as their probable age. This shows, moreover, that the natives of the period of the Conquest recognized these structures as the work of their own ancestors, and not of an unknown or mythical people. They did not see in them anything beyond their own ability to imitate.

The records of the Mexican commonwealth did not extend so far back as those of the Mayas—at least not with the air of authentic chronology. We soon reach an age of magicians and monsters. So far as buildings of stone and mortar are concerned, those of the Maya races show signs of a more venerable antiquity and greater skill at a remote epoch in lapidary-work. Therefore, we are reasonably safe in inferring that the ruined cities of Central Mexico are not more ancient than those farther south. Various other considerations strengthen the opinion that we need not go back much further than the year 1000 of our era for the date of construction of most Aztec cities.

Pottery and Stone- and Metal-Work.—All archæological collections the world over contain specimens of Mexican antiquities. It is important for collectors to know that there are now three villages in Mexico whose main business is the manufacturing of antiques for sale. One of these is close to the ancient royal city of Tezcuco. These modern antiques preserve, at any rate, the veritable old models, as they are careful imitations of genuine finds. The industry of the ancient artists was principally directed to work in pottery and stone. Obsidian and jade were the most highly prized, the former breaking readily with a conchoidal fracture and an extremely keen edge. For this reason it was admirably adapted for arrow- and spear-heads, daggers, knives, and razors. By long friction with silicious sand it can be given a high polish, and thus treated it was used for mirrors. Masks, used in dances and religious ceremonies, were cut from serpentine; others were made of wood and ornamented with a fine stone mosaic of chalcedony, turquoise, malachite, and similar highly-prized stones. Quartz, marble, granite, and sandstone were also used, and a huge head of granite is mentioned, 6 feet in diameter, representing a face with negro features and surmounted by a close-fitting skull-cap. Cups formed by the coils of a serpent cut from stone, and stone knives with handles in an elaborate mosaic of cut stone, are other objects which attest the skill of the ancient artists in this material.

The pottery was of black and red clays, well worked and moulded into many eccentric but not often graceful or pleasing devices. Caricature and intentional disproportion pleased the people better than a representation of correct forms, at least of the human subject. Incense-holders, musical instruments, and odd forms of vases are among the more quaint objects occasionally seen. In Nicaragua, where a Nahuatl-speaking people lived in the sixteenth century, there is often found a "flute" or "whistling-jar" of terra-cotta which yields a soft and plaintive note when properly used. In the same locality the vases have a prevailing "shoe-shape" which is not found elsewhere on the continent. Many of the tribes were not ignorant of glazing, and by some raised ornaments were *appliqués* on the vessel after it was once burned, and then it was returned to the fire for a second burning.

Although these nations were acquainted with silver, copper, gold, and bronze, they cannot be said to have passed beyond the Stone age, as they used these metals but little, and not intelligently, in the arts of life. Both in Mexico and Yucatan they made hatchet-blades and chisels of bronze, the latter, according to the best recent authorities, being an artificial mixture of copper ·97, tin ·03, with accidental traces of zinc (Mendoza, in *Anales del Museo Nacional de Méjico*, tom. i.). The chisels are slender, about 6 inches long, with a double bevelled edge. The hatchet-blades are thin and flat, slightly thickened at the sides to give them strength, sometimes with two edges and a central projection like the letter T. Bronze needles and small bronze bells have also been described. Small discs of copper, occasionally discovered in tombs, are believed by some antiquaries to have been *coins* and in actual use as a circulating medium; for which, indeed, there is some slight foundation in passages of early writers. Gold was well known and freely used for ornaments, as beads, rings, collars, and small images. In Yucatan it was scarce, and so largely alloyed with native copper that for a score of years after Mexico had fallen the Spaniards did not consider that peninsula worthy their attention. In the northern continent the goldsmith's art reached its highest perfection among the tribes near the Gulf of Chiriqui. They possessed the art of working the metal in two different ways—the one by soldering gold wires, drawn out into the finest threads, upon thin hammered plates of the same metal (the plates giving the general shape and outline, the wire adding bulk, shade, and design); the other by founding and casting hollow figures. Specimens of this work often excite the astonishment of the most skilled goldsmiths of to-day. Great numbers of such figures have been found in the so-called "guacas" or tombs in the neighborhood of Chiriqui. Most of the river-sands of that region are auriferous, and gold was so common among the natives that the Spaniards gave the province the name of *Castilla del Oro* or *Costa del Oro*. The smelting and casting both of gold and copper were familiarly known to these natives, as well as to the Aztecs and their neighbors.

Methods of Writing—Books and Inscriptions.—A system of picture-writing was perfectly familiar to the Aztecs, and had been long in use before the Europeans came. Many specimens of it are still preserved, and of some the translations are also given. Such, however, was the lack of appreciation of the early settlers that they have left no satisfactory and complete description of the principle on which the writing was interpreted. Consequently, there has been, and is, a divergence of views among antiquaries as to whether it is picture-writing simply, or whether it represents sounds also; in other words, whether it is in a measure phonetic, and, if so, to what extent. The most modern opinion by those competent to judge may be taken to be that of M. Aubin (*Mémoire sur la Peinture didactique des anciens Mexicains*, 1853), as modified and extended by Señor Orozco y Berra ("Ensayo de Descifracion Geroglifica," in *Anales del Museo Nacional de Méjico*, 1878–80.) These students, after a close analysis of genuine ancient documents, discriminate three forms of writing in use in ancient Mexico. The one is simple picture-writing, such as that found among the northern hunting tribes. In this the figures refer to the thought only, and depict the occurrence as it took place. The second is where the first elements of phonetics come in. The name of a town or of a man is represented by two objects whose names pronounced in sequence sound like that of the town or man. This is the familiar principle of the *rebus*. Thus, the surname of the first Montezuma (1440–64) was *Ilhui-camina*. To represent this the scribe drew the conventional sign of the sky, which in Nahuatl is *il-hui-catl*, and an arrow, *mina*, which two words sound closely like the name of the ruler. There is here an obvious departure from picture-writing, as the appeal is no longer to the eye, but to the ear—not to the thought, but to the word. This is the graphic method employed in the tribute-rolls and title-papers. It was awkward and incomplete, as there are many words out of which no rebus could be made. Therefore they devised the more advanced and easier method of having a character represent merely its initial sound. Thus, the sign for water, which in Nahuatl is *atl* (in composition *a*), represented the first vowel-sound of the (Spanish) alphabet; a sign representing a vase, *comitl*, was the syllable *co;* a bean is *etl*, and would stand for *e*. This was as far as the Aztecs advanced, and even when they employed this more perfect script they also introduced, from old habit and long custom, many rebuses, ideograms, and pictures. We can say that they were on the highroad to a true phonetic writing, but had not reached it.

All the early writers claim for the Mayas a still more complete literate system; and the few manuscripts we have of theirs seem to prove it. But even deeper than in Mexico is the obscurity which rests upon the details of their method. The second bishop of Yucatan, Diego de Landa (d. 1579) left a so-called "alphabet" in their characters, and there is a specimen or two of its use by Spanish missionaries in didactic books for the natives. But Landa's alphabet turns out on examination to be merely the letters of the Spanish alphabet expressed according to the third Aztec method described above, and the characters used by the missionaries, while borrowed from the natives, are assigned arbitrary values which they could not have originally possessed. Many of the figures sculptured on the ruins of Palenque and Copan reappear in the manuscripts, showing conclusively that they were widely recognized as signs of fixed meaning. Three Maya manuscripts have been published—one known as the Dresden Codex, chromo-photographed in 1880; the Codex Troano, chromo-lithographed by the French Government in 1869; and the Codex Peresianus, photographed by Government authority in Paris in 1864. Various efforts at their interpretation have been made, but none of them can be called successful. A highly satisfactory analysis of the Codex Troano has, however, been made by an arithmetical method by Prof. Cyrus Thomas of Illinois (*A Study of the Manuscript Troano*, Washington, 1882); while the methods applied to deciphering cryptography have been brought to bear with some success on the sculptured tablets of Copan and Palenque by Prof. E. S. Holden of Washington (*Studies on Central-American Picture-Writing*, 1881). A number of Mexican manuscripts were published in facsimile in Lord Kingsborough's monumental work on *Mexican Antiquities*, and others by M. Aubin of Paris.

Both Aztecs and Mayas wrote on paper made from the leaves of the maguey-plant (*Agave Americana*). They were macerated, and the fibres felted together by a process of beating. The surface was then glazed with a white and permanent sizing or varnish, and the figures or characters painted on in brilliant colors. Each book consisted of a single strip, several yards in length and about ten inches wide, folded like a screen, the outer leaves protected with boards often elaborately carved and ornamented. The writing proceeded from left to right and from above downward. Besides this paper they also had a very durable parchment from the skins of deer, cured and thoroughly smoked so as to withstand the attacks of insects. The topics treated of in their books were their chronology, their ritual, dreams and prophecies, their medical superstitions, and the portents of marriages and births.

The Calendars and Chronological System of the Mexican and Central-American nations had reached an extraordinary degree of accuracy. It has even been said, with a fair show of truth, that the calendar of the Aztecs (which was almost the same as that of the Mayas) was more perfect than that of their European invaders. It was, however, somewhat complicated, and there are points in it, especially with reference to intercalation, which have not yet received a satisfactory explanation. In Mexico the maximum unit of time was 104 years, but in Yucatan the great cycle was 312 years (or, as some say, 260 years). In the latter country the year began on July 15th—in Mexico in February. The signs of the days, months, and other periods of time constantly recur in the manuscripts and on the mural sculptures of the ruins, and there is ample testimony to the constant attention to astronomical calculations paid by the native scientists. The so-called "Mexican Calendar-stone," one of the most striking monuments of American antiquity, was long supposed to be an instrument for use in chronological calculations; but the later writers on it have declared it to be "an astronomical and cosmogonical study of the sun" (Alfredo Chavero, *Calendario Azteca, Ensayo Arqueológico*, Mexico, 1876; "La Piedra del Sol," in *Anales del Museo Nacional*, tom. i. and ii.; *The Mexican Calendar-stone*, by Ph. J. J. Valentini, 1879). It may briefly be said to have been a votive tablet and a sacrificial altar. Similar but less complicated circular stones have been exhumed in other parts of Mexico and in Yucatan. All evidently derive their form from the "wheel" (Spanish *rueda*, Nahuatl *yoalli*, Maya *uazlazon*) which was employed by the natives in their chronological calculations.

The Colombian States.

Several tribes of considerable cultivation were found in the high table-lands and fertile valleys of New Granada or Colombia. The most important of these was that of the Chibchas or Muyscas, who inhabited the province of Cundinamarca. Their architectural remains are few, as their houses were of wood, but they were skilful goldsmiths; and, as gold is found in abundance in most of the mountain-streams of New Granada, they had unusual opportunities to develop this talent. Their figurines were usually hollow and cast, representing men, beasts, birds, and other objects. They also used gold coins for currency, of which a few specimens remain. They have no stamp, but were cast in a mould, and were of uniform thickness. Their value was not estimated by weight, as it is doubtful whether any means of exact weighing was known to the Chibchas, but by the measure of the circumference.

This nation also possessed the art of cutting and working hard stones, and occasionally idols are discovered with features worked in high relief and marked with signs believed to be of a hieroglyphic character. They appear to have had a graphic system, probably of ideograms. Their signs for the first ten numerals have been preserved, and are a series of intricate curves quite remote from anything seen elsewhere.

The Chibchas were not a warlike nation, and were readily conquered by an insignificant band of Spaniards. Finding that their gold and precious stones were the objects that attracted their conquerors, they threw vast quantities of these into the deep lake Guatavita, not far from Bogotá. Several efforts have been made to drain this body of water, and a number of interesting antiques have been obtained from its shores in periods of drought; but the great mass of the treasure still remains beneath its waves. It is also asserted that metal relics discovered in the caves and around the ancient mines of this region prove that the natives knew of an alloy of gold, copper, and iron "to which they were able to give the temper and hardness of steel" (A. Codazzi, *Antigüedades Indígenas*, Bogotá, 1858). It is certain that their skill in fine gold-work impresses the best artists of to-day with astonishment (E. Uricoechea, *Memoria sobre las Antigüedades Neo-Grenadinas*, Berlin, 1854).

In the southern mountain-valley of Colombia some peculiar relics of the Andaquis deserve notice. They are stone images from 3 to 8 feet high, carved with unexpected precision from a hard ferruginous sandstone. The features are usually grotesque or terrible, but occasionally human and pleasing. The remains of the temples of this people show that they were built underground or in the centre of large artificial mounds, the heavy stone roofs being supported by pillars often elaborately and even tastefully carved of the same material (fig. 4). The principal locality of these curious remains is the valley of San Augustin, on one of the head-waters of the river Magdalena, a spot which was evidently devoted to the special culture of the rites of the ancient religion (Felipe Perez, *Estados Unidos de Colombia*, Bogotá, 1863).

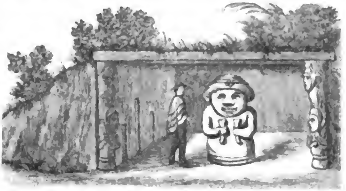


Fig. 4.—Underground Shrine, Colombia.

Peru and the Inca Empire.

In many respects the ancient empire of the Incas offers the most abundant harvest to the archæologist. The natural artistic inclinations of the people had been cultivated by a firm government and long periods of peace.

Architecture.—The materials used in the Peruvian structures varied with the locality. On and near the coast beds of clay are found which served the ancient architects for the manufacture of bricks. These are found of all sizes, from a few inches to 3 or 4 feet square. They were sun-dried, and laid in rows, each size by itself, thus producing a pleasant effect to the eye. The larger ones were often polygonal, of varying angles, and the interstices left in the wall were filled with smaller bricks of the same material. In the interior stone was exclusively employed, and in many different styles. Cyclopean or megalithic walls of polygonal blocks 5 and 6 feet in diameter are not uncommon. These are laid without mortar, but the surfaces are so finely polished and so nicely adjusted that the blade of a knife cannot be inserted between them. Some of these walls have additional solidity by an arrangement on the principle of a mortise and tenon, by which a projecting part of one stone fits into a recess in that above or below it. Examples of this also occur in the northern continent in the ruins of Tula near Mexico. The stones used are often extremely hard granite, diorite, porphyry, and basalt. As the natives certainly possessed no metal tools hard enough to accomplish such work, their method has puzzled antiquaries and given rise to wild hypotheses. There is little doubt, however, that they accomplished these extraordinary tasks simply by the use of friction, rubbing one stone against another, with the aid of sharp sand. Another class of walls was strengthened with mortar, laid either between the stones or in a thick layer on the inner or outer surface. For these walls much smaller stones were selected, and they were often undressed. In their erection the square and plummet were probably not used. The eye and the practised hand were aided by long straight canes, forming a frame which was often built into the wall. Some of the walls are of immense solidity—10, 20, even 30 and 40, feet thick—and these are not merely shells filled in with earth, but solid brick or stone and mortar to the core. They are, however, not of great height, seldom reaching above 30 feet. Pillars or columns, though not unknown, as they are found in the temple of the Sun at Pachacamac, were little used. This is supposed to have been owing to the light roofs and the employment of wood to support them. The true arch is nowhere found, although in the palace of the Inca at Caxamarca, and again on the island of the Sun at Lake Titicaca, there is a close approach to the "Maya arch;" that is, the doorway is finished above by overlapping stones approaching the centre. Niches are a prominent feature in Peruvian architecture, and have been supposed to serve for store-rooms, cupboards, sentry-seats, etc. But they often occur where no conceivable purpose can be suggested.

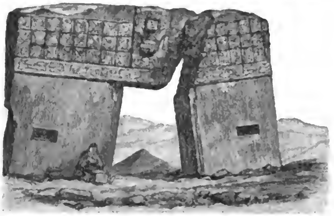


Fig. 5.—Gateway, Lake Titicaca.

The site of the edifices was not so constantly on mounds or pyramids as in the northern continent. They have been classified as—(1) surrounded with a row of large upright stones, somewhat similar to the Druidic remains at Stonehenge; (2) surrounded with closed walls; (3) elevated on a platform of one, two, or at most three, terraces; and (4) simply located in an open, level space. The size of the structures varies from the simple hut of stone about 12 feet square to the immense fortresses of Pisac and Ollantatambo, but which are in fact mountains transformed by encircling walls into immense pyramids with numerous terraces. The remains of large communal dwellings, three and four stories high, surrounding an interior court, are seen at various points. All buildings of any importance were laid out to conform to the cardinal points, and the principal entrances always faced the east. Steps and stairways in stone were laid with skill both to the outer doors and in the interior of the buildings.

The construction of tombs was an important branch of domestic architecture. These were either below ground or in tumuli above the level of the soil. The general name for both is *huaca*. The sepulchral tumuli on the coast were of brick, which, as rain is rare in that region, offered a very permanent material. The tombs usually have several compartments, and were evidently destined for the different members of a family. As it was the universal custom to deposit with the dead a large number of articles which it was believed would be of use in the future life, and as the body was mummied with considerable skill, the huacas offer a rich field of archæological research. In the interior extensive caverns were cut into the sides of the vertical precipices of the Cordilleras, and the mummied bodies of the dead deposited therein. Many of these are wholly inaccessible, and can only be known by their walled doorways and other signs of man's handiwork. On the high plateaux of Vilque sepulchral towers of masonry from 15 to 40 feet in height, circular or polygonal in outline, often present forms of remarkable symmetry. They are known as *chulpas* (fig. 6). Sarcophagi of a single stone or of two large stones, hollowed out in an ovoid, cup-shaped interior, are also not unusual.

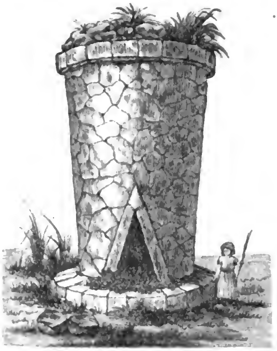


Fig. 6.—Stone Tomb, or Chulpa, Peru.

Hydraulic Works.—Few of their remains reflect such credit on the ancient Peruvians as their aqueducts and other works for the preservation and distribution of water. Some of their most gigantic undertakings were for the peaceful purpose of irrigation. They dammed up the streams to form large lakes in the rainy season, that they might have sufficient for agricultural purposes during the dry months. Solid walls of stone and concrete were built for the dam-breasts and for the conveyance of the water. Vast subterranean cisterns, solid dykes along the rivers to prevent the meadows from being overflowed by freshets, tunnels to drain the excess of lakes, and artificial ponds and cascades, were other varieties of hydraulic works in which the native engineers excelled, and have left durable monuments of their ingenuity.

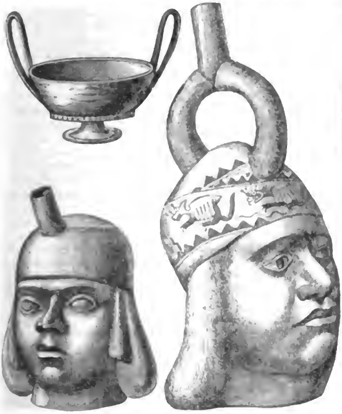
Roads and Bridges.—The "Inca roads" were famous for excellence, and in many places still offer by far the most convenient avenues of transit. They are from 15 to 25 feet in width, bedded with small stones often laid in concrete, and laid out to conform as much as possible to the advantages of the soil. As the use of beasts of burden was almost unknown, the roads did not ascend a steep inclination by zigzags, but by steps cut in the rock. At certain distances public houses were erected for the protection of travellers. Some of these still offer the best lodging-houses to be found along the routes. Bridges were of wood, of ropes of fibres of maguey, or of stone. Some of these latter are still in excellent condition, in spite of the violence of the mountain-torrents which they have spanned for four centuries.

Sculpture.—The sculptures in stone are not equal to those in Central America. To a still greater degree the artist was fettered by the matter in which he worked. The limbs were rarely detached from the body, and the fortuitous contour of the block was what guided the sculptor in giving position and expression. Hence he never reached to any freedom of execution, and the canons of proportion remained a sealed book to him. Much of this was owing to his limitations from lack of tools hard enough to incise the block, but much of it also to want of fertility in imagination.

Metal-work.—The first explorers recorded their astonishment at the perfection of the goldsmith's work, and the comparatively few specimens which have been preserved fully justify their praise. The skill of the natives with the hammer was such that it is impossible to discover the joints in their workmanship. Vases showing very well executed *repoussage* are not uncommon. They also understood the art of inlaying metals

—*damasquinage*, as it is called. Thus they would inlay gold upon copper or red upon yellow copper, producing a very agreeable effect. Occasionally this was carried to the extent of completely gilding objects of copper, the layer of gold being beaten out to extreme tenuity. Gold-beating had been prosecuted to remarkable delicacy, and the very thin layers of gold-leaf on many articles led the Spaniards at first to believe they were of the solid metal. These delicate layers were arranged into ornaments, birds, butterflies, and the like, with much skill. They were also acquainted with various alloys, as of gold and copper, copper and tin, and silver and lead, in the last mentioned of which some of the finest specimens of mould-work are found.

Pottery.—Their ceramic art deserves to rank with the finest on the continent, both in regard to variety of design and technical skill in preparing the material. Vases with pointed bottoms and painted sides, recalling those of ancient Greece and Etruria, are often disinterred along the coast. It has been suggested that in that sandy tract this form of a vase could readily be sunk into the soil to protect the contents from the rays of the sun. The primitive artist rarely drew on his imagination for his design. He imitated with servile fidelity the object he chose as a model, but he varied his models to a surprising degree, and it would be difficult to name any object in the range of his observation that he did not imitate in his earthenware. Fruits, fish, animals, birds, skulls, heads, persons in various positions, masks, monsters, members of the body, canoes, and whatever else could be simulated in clay, were reproduced. There was also developed with many ingenious combinations the art of manufacturing musical jars, such as have been before referred to as occurring in Nicaragua. Some of these would be self-acting, the percolation or motion of the contained liquid producing a musical note; others, in the form of certain animals, would give forth the peculiar cry of that animal upon being blown into; and it is even said that some imitated with singular fidelity the human voice. Other receptacles are so-called "magic vases," such as are still manufactured in India. Owing to a peculiar arrangement of tubes, the vessel when filled can be emptied only by holding it at a certain angle. In spite of the manifest skill displayed in these ceramic productions, no application of the art appears to have been made to religious purposes or to the higher branches of statuary. This probably arose from the fact that it was carried on largely by the women and children.



FIGS. 7, 8, 9.—Ancient Pottery.

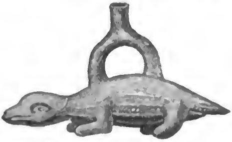


FIG. 10.—Ancient Pottery.

Painting and the allied arts of design were prosecuted in a conventional manner. The outlines of the figures are geometrical, and rarely convey the impression of life. The curve, which is so indispensable to the expression of grace or beauty, is generally replaced by an arc of a polygon of many sides. To compensate for this defect of *technique* they developed a surprising fertility in rectilinear patterns, many of which produce a pleasing impression. They had no notion whatever of light and shade, and were totally ignorant of perspective. On the other hand, they had an accurate eye for color, and displayed their resources in this respect with boldness and good taste. The vases are colored in soft and harmonious tones, and, although frequently polychromatic, do not offend by violent contrasts. Woven stuffs, on the other hand, often present strongly opposed tints, but the effect of the whole is rich and agreeable, resembling that of the product of Oriental looms.

Weapons.—As a people essentially preferring peace to war, the Peruvians had made less progress in their weapons than in their utensils. They appear to have been entirely ignorant of the bow and arrow; even darts and lances were little known; hence the arrowheads and spear-points which form so large a portion of the archæological finds of the northern continent are not prominent in Peruvian collections. Their principal arm for action at a distance was the sling, and carefully worked sling-stones are frequently disinterred. For hand-to-hand fighting war-clubs and wooden swords were employed. The former usually terminated with a stone, into which the handle was inserted. Instead of a stone a solid piece of metal, occasionally gold, several pounds in weight, was selected. Short lances, the haft of wood and the point of metal, either bronze or silver, are also preserved. Some of these are ornamented with care and tipped with gold, and probably served rather as ornamental appendages than as weapons in actual warfare.

Quipus.—In these various decorative designs there is little similarity to any connected graphic method. Even the simpler forms of picture-writing were little in use among the Peruvians. There is indeed a deceptive similarity to alphabetic characters in some of the designs in their woven stuff, but a close examination proves these to have been meaningless ornaments. The method by which they recorded facts was the *quipu.* This consisted of a base cord to which other cords, differing in color and knotted in various fashions, were attached. Each color, each knot, and the differing lengths of the cords, had so many fixed conventional significations, varying with the subject which the quipu was used to commemorate. It is easy to see that the quipu would be meaningless without a verbal commentary, but that, on the other hand, it would serve very well as an aid to the memory, and also as a check on the statements of the narrator. For estimating tributes, enumerating warriors, or recalling dates and events it would have many useful applications.

Inscriptions.—The nearest approach to inscriptions is found on the monoliths of Tiahuanaca, near Lake Titicaca. These remarkable monuments are by many attributed to an age previous to the beginning of the Incarial dynasty, and there is certainly some general resemblance to the style of sculpture seen in Central America (Leonce Angrand, *Antiquités de Tiaguanaco*, 1866). But a careful examination of the copies of these designs reveals that they are repetitions of figures, such as are frequent in other decorative designs of the Peruvians, and could not have been intended to convey a connected record.

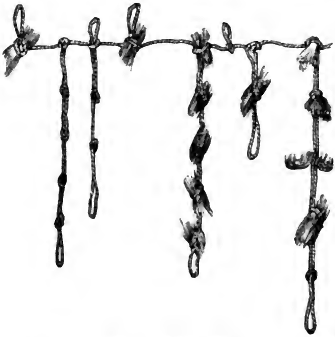


FIG. 11.—Quipu, Peru.

Of recent writers on the archæology of Peru may be mentioned E. G. Squier, *Peru: Travels and Explorations in the Land of the Incas*; Desjardins, *Pérou avant la Conquête espagnole*; Ch. Wiener, *Pérou et Bolivie*.

BUENOS AYRES, BRAZIL, AND THE WEST INDIES.

In the remaining portions of South America vast tracts which might yield interesting results to the archæologist are unexplored. The soil of the Pampas and the alluvial plains along the Rio de la Plata and its tributaries have furnished stone axes, hammers, scrapers, and arrow-heads very similar to those familiar in the Eastern United States (Florentino Ameghino, *Noticias sobre Antigüedades Indicas*, 1871, with photographs). The vast lowlands of Brazil are still largely peopled by savage tribes. They wear the nose, ear, and lip stones, as did their ancestors when first seen by the early navigators; and the "medicine-stone," a polished and perforated slab of jade, is still treasured as of magic efficacy and handed down as an heirloom from generation to generation (C. F. P. von Martius, *Beiträge zur Ethnographie und Sprachenkunde Amerikas*). A distant branch of the great Tupi-Guaranay family, which extended its members from the Rio de la Plata to the Caribbean Sea, also peopled the Greater and Lesser Antilles and the Bahamas, but did not found any colonies on either of the great peninsulas of the northern continent, Yucatan or Florida. The relics they have left in Haïti, Jamaica, and Cuba have received some attention. They consist of articles of pottery, frequently of large size, moulded in the forms of animals, fish, and men; small idols of gold and stone; rude sculptures and paintings on the walls of natural grottoes; arrow-points, grooved stones for hammers or war-clubs, and the like (Nicolas Fort y Roldan, *Cuba Indígena*, Madrid, 1881; Francisco Pi y Margall, *Historia General de América*, Barcelona, 1880). (D. G. B.)

ARCHÆOPTERYX (Gr. ἀρχαῖος, original, pristine, antique; πτέρυξ, a wing), the most extraordinary bird known, and geologically the most ancient; a connecting link between reptiles and modern birds, and the basis of one of the primary divisions of the class *Aves*. The original specimen was discovered in 1861 by Andreas Wagner in the lithographic slate of the Jurassic period at Solenhofen in Bavaria; it was named *Archæopteryx lithographica*, and subsequently called *A. macrura* by Owen. The sub-class of *Aves* represented is termed *Saururæ* (lizard-tail birds). The original specimen failed to exhibit many characters which have been shown by the one since found in better preservation. The bird displays perfect feathers and a bird-like structure of the leg and foot; it was a feathered flying biped, but reptile-like in many particulars. The jaws bore true teeth, like those of the American Cretaceous genera *Hesperornis* and *Ichthyornis*. The sternum and clavicles were bird-like. There were free metacarpal and metatarsal bones, and the digits of the hand terminated in claws. The tail was longer than the body, and possessed about twenty vertebræ, each bearing a pair of large feathers; so that this part of the body was lizard-like, yet with feathers arranged in distichous series, instead of spreading fan-like from the end of the tail, as in all modern birds. (E. C.)

ARCHBALD, a borough of Lackawanna co., Pa., is on the Delaware and Hudson Railroad, 10 miles N. E. of Scranton. It has several hotels, three churches, and a graded school. It is in the midst of rich mines of anthracite coal. Population, 3049.

ARCHDALE, JOHN, governor of Carolina 1695–96, was the son of Thomas Archdale of Chipping Wycombe, Bucks, England. In 1664 he came to New England as agent of his brother-in-law, Ferdinando Gorges, whose proprietary rights to Maine, inherited from his grandfather, Sir Ferdinando Gorges, had been for a time disregarded. Archdale afterwards purchased the interest of one of the proprietors of Carolina, and when it was found necessary that some one should go to the colony with authority to settle the serious dissensions that had arisen, he was appointed governor. He landed at Charleston in August, 1695, and as soon as possible called an assembly. By his mild manners and vigorous measures he repressed the factious spirit of the colonists and made warm friends of the hostile Indians. Although a Quaker, he put the militia in a state of efficiency, but exempted Friends from military service. The people of North Carolina gladly accepted his rule, and one of his daughters was married to a planter at Pasquotank. Having restored tranquillity and prosperity, he returned to England at the close of 1696. He was elected a member of Parliament in 1698, but was not allowed to take his seat, on account of his scruples about taking the oath. In 1707 he published *A New Description of the Fertile and Pleasant Province of Carolina*. In 1708 he conveyed his right as proprietor to his son-in-law, John Danson.

ARCHENHOLZ, JOHANN WILHELM, BARON VON (1741–1812), a German historian, was born in Langfuhr, a suburb of Dantzic, Sept. 3, 1741. He entered the Prussian army as an officer in 1760, but at the end of the Seven Years' War he resigned on account of his wounds, and then spent sixteen years travelling throughout Europe. After his return to Germany he resided chiefly in Dresden, Leipsic, and Berlin until 1792, when he settled near Hamburg. He devoted himself to literature, and edited several periodicals intended to promote acquaintance with foreign literature, especially English. He died on his estate in Oyendorf, in Holstein, Feb. 28, 1812. His most prominent works are—*England und Italien* (5 vols.; 2d ed., Leipsic, 1787; translated into several languages); *Annalen der britischen Geschichte* (20 vols., 1789–98); *Die Engländer in Indien* (3 vols., 1786–88), translated from Orme's *History*; *Geschichte des Siebenjährigen Kriegs* (2 vols., 1793; 11th ed. 1879); *Geschichte der Königin Elisabeth* (1798); *Geschichte Gustav Wasas* (1801).

ARCHITECTURE (AMERICAN).

See Vol. II. p. 334, Am. ed. (p. 382 Edin. ed.).

IN considering the architecture of America one essential and radical distinction must be kept in mind which separates it from the architecture of all the old countries. In the early civilizations the architecture was indigenous. It grew directly and inevitably out of the climate, the soil, the institutions, the manners and customs of the people—what Taine calls the *milieu*. The architecture of Egypt, of India, of Greece, of Rome, and to a less extent the architectures of the nations of modern Europe, are as characteristic as their languages. While the nations were divided one from another by a more or less impassable gulf of national prejudice and hatred, while travel was difficult, and the popular institutions, cast in a rigid mould, were protected from all change by popular ignorance of the world beyond their own borders, this individuality in architecture was a necessity of the case. But the spread of modern civilization and colonization levels all barriers, and substitutes uniformity for individuality. Thus we see to-day English architecture in India and French architecture in Egypt.

In the seventeenth century, when the American wilderness was beginning to blossom under the feet of the European colonists, there existed in each of the countries from which those colonists were drawn, a monumental architecture of great splendor and a domestic architecture of great picturesqueness and beauty. But it was even then an architecture of the past, and its influence upon the feelings of the people had been washed out by the deluge of Puritanism. Moreover, it was an age in which all art was in a condition of decay and dishonor. Among the wealthy the passion for private luxury and display had taken the place of whatever love of art might formerly have animated their class. But the colonists were not wealthy, and with them there was, on arriving at their new homes, no question of the fashion of building, but only of securing, as quickly and cheaply as might be, serviceable houses for shelter.

Such as they were, the earliest buildings in all the colonies have long since passed away. They were of perishable materials and of slight construction, and had no claims to permanence. When in the course of a generation or two the colonists found themselves able to add to their better dwellings and to their houses of worship some touches of modest luxury, their efforts were naturally governed to some extent by the remembrances and traditions of their old homes. Thus, whatever variety is to be observed among the early buildings of the various colonies is due chiefly to their different origin. The houses of New England and Virginia and the Carolinas do not greatly differ from each other, for in all these colonies they were the work of artificers brought from England and trained in the methods and style of the English builders of their day. The early houses of New York and Pennsylvania are equally similar in their descent from the Dutch and German models of their time.

With the growth of the colonies in wealth and importance the art of building became of more esteem in the eyes of well-to-do people, and architects from England appeared at intervals in the chief towns. Peter Harrison, a pupil of Vanbrugh, and concerned with that master in the works at Blenheim during the reign of Queen Anne, built in 1749 the King's Chapel at Boston, a massive stone church with a fine interior and a low tower with a peristyle of Ionic columns at its base. Gibson, a pupil of Wren, built in 1752 St. Michael's Church at Charleston, S. C. (fig. 1), whose fine steeple is still the chief ornament of that city and is not unworthy of Wren himself. Contemporary with these is Christ Church in Philadelphia (fig. 2), more consistent in design than either, but of which the architect is not known. The steeple, 196 feet high, was built after the church was otherwise complete, from the proceeds of a lottery set up for that purpose, and of which Franklin was one of the managers. The elevation of the central portion of the east end of this church as a balance to the steeple at the other end, and the treatment of the sides with their two orders of pilasters enclosing the arched windows, are indications of a matured ability in design which was very rare among the wandering architects of those early days.

Of the civil buildings of about the same date with the churches above mentioned, the town-house at Boston, now known as the old State-house (fig. 3), and the Philadelphia State-house (Pl. III), may be cited as characteristic examples, of which the former had, in the outline of its end-gables and in its central tower, features which gave to the composition an unusual picturesqueness of effect.

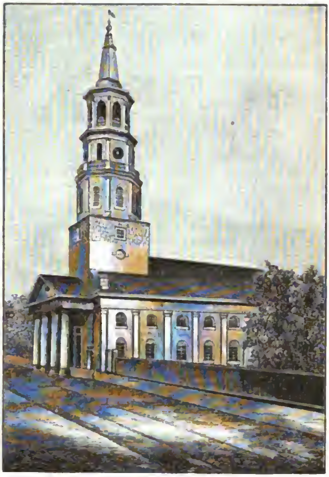


FIG. 1.—St. Michael's Church, Charleston, S. C.

In many of the smaller towns, as Newport, Salem, Albany, Richmond, Savannah, individual examples are to be met, not so much of the growth of polite taste in architecture as of the increase of prosperity and the accidental and temporary presence of architects from abroad. The population of the colonies had by the middle of the eighteenth century grown nearly or quite homogeneous, the English immigration gradually smothering the Dutch and German elements of the earlier days. The characteristics of the colonial buildings had thus become entirely English. Of the English architecture of that time little good can be said. Wren and Jones had passed away and had left no successors. The splendid parks of the nobility groan under the ponderous and tasteless piles of building erected by Vanbrugh, Kent, Campbell, and the brothers Adam; the sumptuous pages of the *Vitruvius*

Britannicus have handed down their pretentious ugliness to an admiring posterity. But the disciples of these masters who found a modest field for their talents in the American colonies were fortunately prevented by the smallness of their opportunities from emulating the achievements of their teachers. On the limited scale of even the grandest of the colonial houses a very little architecture went a great way. A simple order of pilasters or engaged columns at the main entrance, with an entablature and pediment, an Italian cornice at the eaves, perhaps enriched with dentils or modillions, quoins at the main angles of the building, a hipped roof of rather low pitch crowning the whole,—such is the most common type of the better class of colonial dwelling-houses in the generation just preceding the Revolution. Wood was the usual material throughout, but in the exceptional instances where the walls were of brick or stone the ornaments were always of wood, cut stone being practically unknown. In the interior an equally rigorous simplicity prevailed. The houses were extremely simple in plan, an entrance-hall, seldom more than 10 to 12 feet wide, running through the middle from front to rear, with a straight staircase on one of its walls and two square rooms opening from each side. The staircase was commonly the most elaborately designed feature of the house, and much ingenuity of invention was often bestowed on its newel-posts, its twisted balusters, its carved string, and its panelled soffits. The walls of the hall and stairway and of the principal rooms were usually wainscoted in square panels of no great height. In rare instances the best parlor was graced with a wainscoting extending from floor to ceiling. Oftener a single broad panel was set above the chimney-piece, finishing with a light wooden cornice under the ceiling.

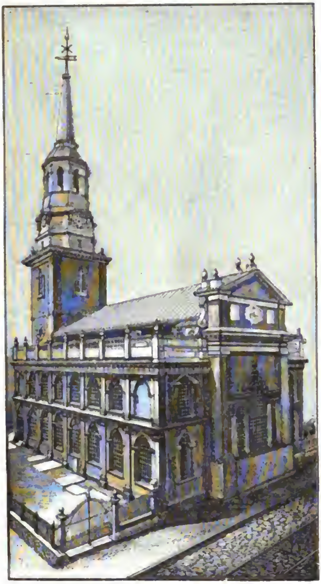


FIG. 2.—Christ Church, Philadelphia.

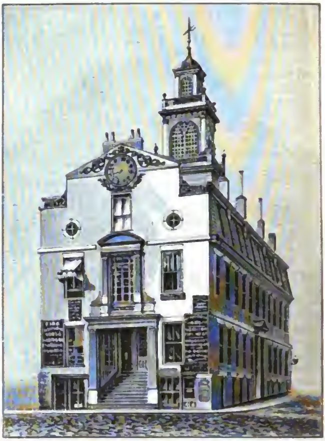


FIG. 3.—Old State-House, Boston, Mass.

Of all this work, simple and unambitious as it was, the invariable characteristic was a delicate reserve. No exaggeration or coarseness of profile in the mouldings, no excess or misuse of ornament; everywhere a certain timidity, not unmixed with refinement, and even elegance.

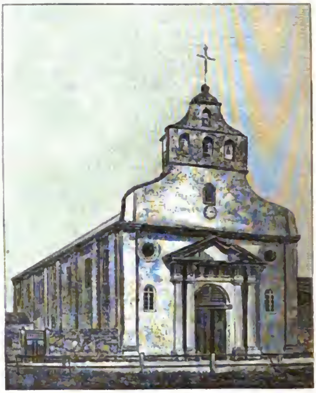
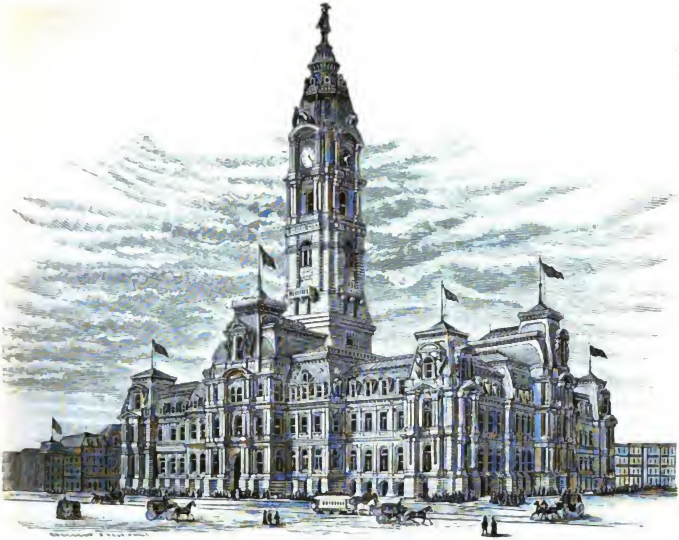
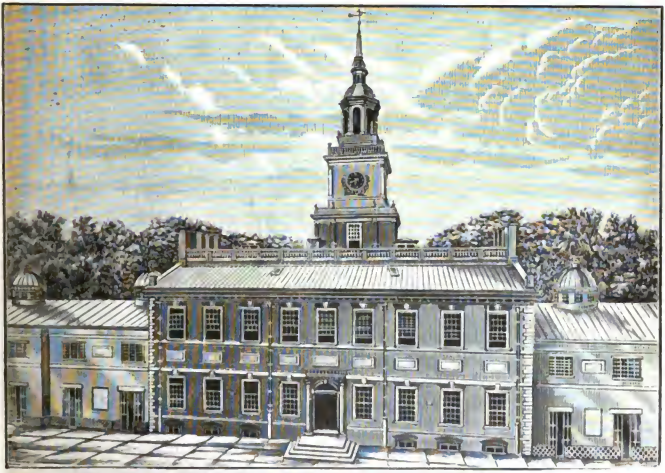


FIG. 4.—Spanish Cathedral, St. Augustine, Florida.

There were, however, two outlying settlements where the conditions which produced this general type of colonial architecture did not prevail. Florida and Louisi-



City Buildings, Philadelphia.



Old State-House, or Independence Hall, Philadelphia.

ana were, during the period of which we are now speaking, as thoroughly Spanish and French as the Thirteen Colonies were English. The architecture of St. Augustine and New Orleans reflected its continental origin. St. Augustine indeed remains to this day a town of the Old World, with its original physiognomy substantially unchanged; with its cathedral (fig. 4), its town-gate, its narrow streets, its balconied houses, its high garden-walls, its ancient fortress, its rude masonry constructed of that curious conglomerate of shells known as *coquina*, to which the moist and warm climate has imparted in the course of two hundred years an aspect of venerable age which in another latitude would require thrice the time to produce.

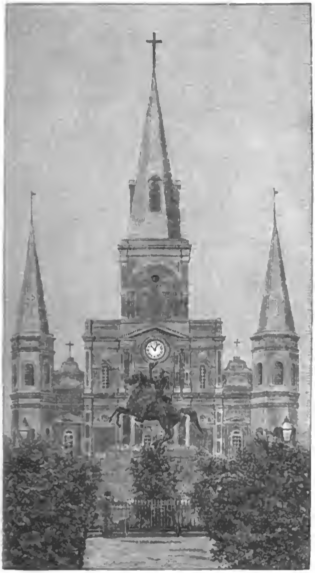


FIG. 5.—French Cathedral, New Orleans, La.

In New Orleans also, though to a less remarkable degree, the ancient European character of the town has been preserved. The growth of the modern city has left the old French quarter essentially untouched, and its aspect is still that of a provincial town in the centre of France. There are few conspicuous buildings, either public or private, but the old cathedral of St. Louis (fig. 5) still stands in the centre of one of the sides of Jackson Square, fronting the river, and flanked by two similar municipal buildings of eighteenth-century architecture, the three buildings occupying the whole breadth of the square and forming a group of remarkable picturesqueness.

The steady growth of the English colonies in wealth and taste was rudely interrupted by the War of the Revolution. The close of the war found the people in a condition of exhaustion from which it required the rest of the century to recover. A new nation had, however, been created, which required an outfit of public buildings for its various governmental departments. The new capital on the Potomac was to be the scene of active building operations for a generation. In 1792 the Federal commissioners advertised in the newspapers of all the principal cities and towns for designs for a Capitol building and President's house. They had grand ideas of "expressing in some degree in the style of their architecture the sublime sentiments of liberty . . . by exhibiting a grandeur of conception, a republican simplicity, and that true elegance of propriety which corresponds to a tempered freedom." Their ideas of the interior accommodation required were much more modest. The advertisement specified for the Capitol a building of brick, with a conference-room and a Representatives' chamber to contain each three hundred sittings, a Senate chamber with an area of 1200 square feet, lobbies for the two legislative chambers, and twelve rooms, each of 600 square feet area, for committees and clerks. A premium of $500 and a city lot was offered for the accepted design. A considerable number of plans were received, which were duly examined by the board of commissioners, assisted by Gen. Washington; and the premiums were at length awarded to Dr. Thornton and Mr. Hoban for the Capitol and the President's house respectively. Washington preferred for the Capitol a design of "Judge Turner," because it had a dome. It appears to be true that of all the plans received only one was the work of a professional architect. The greater number were mere pictorial sketches, of no architectural character whatever, and for the most part quite incapable of translation into practicable form. Even the drawings of Dr. Thornton included neither ground-plan, geometrical elevations, nor sections. They were therefore put into the hands of Stephen Hallet, who was directed to perfect his own design and to embody in it as much as possible that was characteristic in Dr. Thornton's. He was especially to preserve what Jefferson called "that very capital beauty," the portico of the east front.

Hallet was thus installed as the first architect of the Capitol. Born in France, he received there a professional education, and, coming to the United States shortly before the war, lived in Philadelphia until the Capitol competition called him to Washington. The corner-stone of the new building was laid by Washington in Sept., 1793, and the work proceeded. But Hallet's position as architect was rendered uncomfortable by conflicts with Dr. Thornton on the one hand and Hoban on the other; the latter holding the position of superintendent of public buildings and exercising a certain authority over the architect. Hallet, therefore, resigned his office at the end of two years. His place was taken by George Hadfield, an Englishman, who had received in England a professional training, and had carried off the Royal Academy's prize for architectural design, in virtue of which he had spent four years in travel and study. Hadfield found, on beginning his work at the Capitol, that the drawings left by his predecessor for the execution of his design were insufficient. In proceeding to make good this deficiency he wished to incorporate in the design some ideas of his own. In this desire he was overruled by the commissioners, and quarrels ensued with them and with Hoban the superintendent, which brought his connection with the works to a close in 1798, after three years of service. For five years the works were carried on slowly without an architect, under Hoban's direction, until in 1803 the appointment was given to Benjamin H. Latrobe. Latrobe was born in England in 1764, and after being educated in Germany had been regularly trained in England to the profession of architecture, studying in the office of Cockerell, an architect of good standing in London, creating afterwards a respectable private practice, and still later filling the office of surveyor of the public offices and architect and engineer of the city of London. He came to America in 1796, and was extensively employed both as architect and engineer, building the State penitentiary at Richmond, the Bank of Pennsylvania at Philadelphia, many private houses, and the water-works of Philadelphia. His Virginia practice brought him into acquaintance with Jefferson, who while President offered to Latrobe the position of architect of the Capitol. It was at once accepted, and Latrobe held the office, not without frequent difficulties and conflicts, until, upon the breaking out of the War of 1812, the work was suspended. The progress up to that time had been very slow; the north and south wings, containing the two legislative chambers, were all that had been completed, the two wings being connected by a rude corridor of wood. During the brief occupation of Washington by the British the interior of both these wings was burned by the British troops and left in a ruined condition.

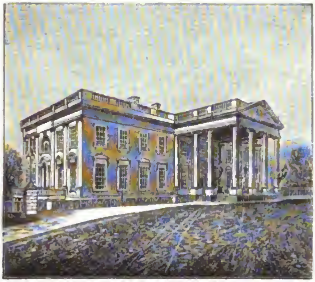


Fig. 6.—White House, Washington, D. C.

When, at the close of the war, Latrobe was called to Washington to recommence the work, it was found necessary to rebuild entirely the interior portions of the building. It was then that the old Representatives' chamber took the semicircular form which it retains today. In 1817, Mr. Latrobe resigned his position. He was succeeded by Charles Bulfinch of Boston, an architect of eminence and of long experience in his own city. Mr. Latrobe's plans for the central portion of the Capitol were so far matured that Mr. Bulfinch's work was for the most part confined to carrying his predecessor's designs into execution. This work he performed with fidelity and good judgment. Some changes were, however, made in the former plans: a greater elevation was given to the central dome, and the approach to the west front was greatly improved by the effective series of terraces and steps. Under Bulfinch the original Capitol was brought to completion in 1827. It had cost about $2,500,000. In less time than had been occupied in its erection it was found to be altogether insufficient to the growing needs of the country, and in 1851 work was commenced on its extension, which was prosecuted with vigor and without interruption, even during the War of the Rebellion, under the charge of a single architect, Mr. Thomas U. Walter, until its completion in 1867. Of the Capitol in its present form (Pl. IV) the original building finished by Bulfinch is but a fragment, enclosed on either side by wings nearly as large as itself, and surmounted by an overwhelming dome, which is a noble feature in itself, but which dwarfs everything beneath it. The old dome, which was removed to make way for the new structure, was of wood, of the diameter of the rotunda below, on which it rested, of less than hemispherical height, and without a lantern. The new dome is of iron, 288 feet high from the ground, of which 217 feet are above the roof balustrade of the building—an unprecedented and exaggerated proportion, born of ambition. Its diameter is 135 feet at the lower colonnade, the diameter of the rotunda on which it rests being about 99 feet. The exterior design of the additions, with the exception of the dome, is sufficiently in harmony with that of the original Capitol, but the interior architecture is lamentably inferior in every respect. The old legislative chambers were noble rooms, not without a character of serious dignity befitting their use. The new chambers are square, commonplace halls, almost destitute of architectural character.

Meanwhile, the other buildings of the Government at Washington, the President's house (fig. 6) and the offices of the executive departments, had all been begun and finished under the direction of James Hoban as surveyor of public works. They were all built in a similar style, of which the motive was to be found in the Italian Renaissance as treated by the French architects of the last century, but without the mansard roof which was so prominent a characteristic of the French buildings. The same general style prevailed in the public buildings which arose in the early years of the republic in the older cities. The State-house at Boston (fig. 7) was begun at nearly the same time with the Capitol at Washington, from the designs of Charles Bulfinch. It is a building of great simplicity, depending for its effect on the projecting centre with unadorned round arches in the first story, supporting a fine Corinthian colonnade with a pediment, above which rises a hemispherical dome. But the disposition of parts is so just and their treatment so broad and dignified that the building has a monumental effect which we miss in most public edifices of greater size and costliness.

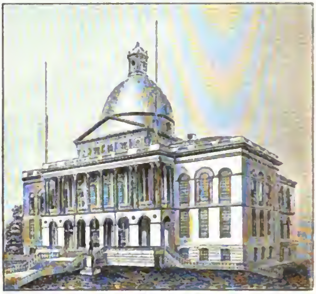


Fig. 7.—State-House, Boston, Mass.

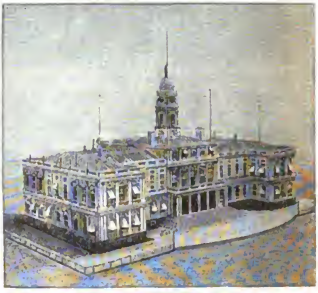
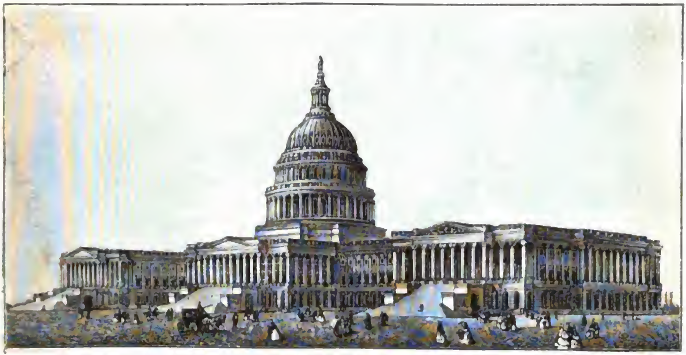
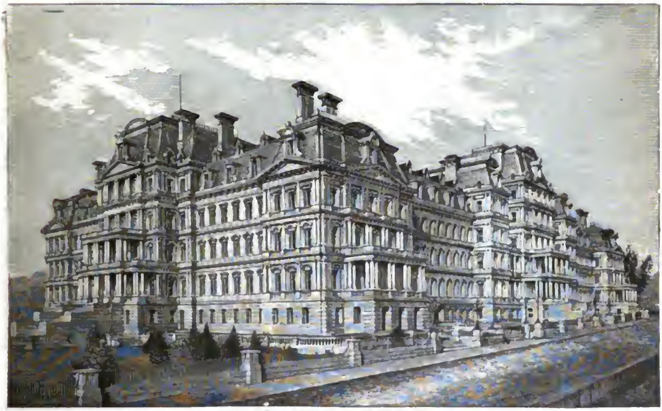


Fig. 8.—City Hall, New York.

The City Hall of New York (fig. 8), begun in 1803 and finished in 1812 at a cost of about $500,000, is a



United States Capitol Building.



United States War Department Building.

building of a simple rectangular plan, 216 feet long and 105 feet broad, in which the same style is employed with marked refinement and elegance. Here the material of the front and the two ends is marble, while the rear is of brown freestone. Such richness of material was as yet extremely rare. Building-stones of good quality were everywhere rare and costly. The Capitol at Washington had been built of a wretched brown freestone from Virginia, which was soon covered with white paint, hardly more out of the desire to counterfeit the nobler material than to preserve the stone from speedy decay. The Boston State-house was built of brick, the colonnade and all the architectural ornaments being of wood.

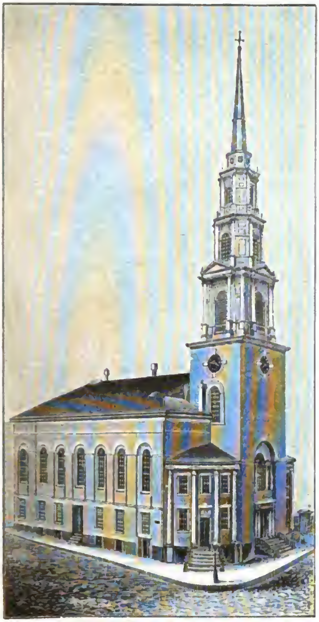


FIG. 9.—Park Street Church, Boston, Mass.

In these early examples of public buildings the result must be reckoned fortunate: the architects followed loyally and without undue ambition the grander models of the European capitals. The same may be said of the churches which were built at the same period. Architects were few and modest, not yet possessed with the spirit of exaggeration, and the examples which remain to us of their work are calculated to inspire us with a sense of respect for the skill, good taste, and temperance with which they used the slender resources at their command. As fair representatives of the churches of the first twenty years of the century we may cite Park Street Church in Boston, built in 1810 (fig. 9), whose fine steeple, as was usual with the earlier churches, is the only architectural feature of the building, but is in itself worthy of Wren or Gibbs; and St. Paul's in New York (fig. 10), a little later, built of brown freestone, and with a more consistent attention to architectural effect both without and within.

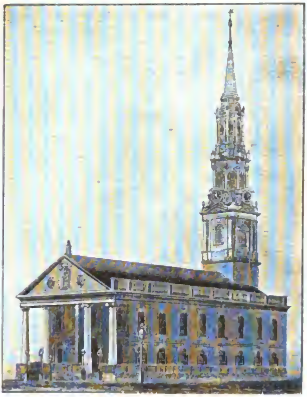


FIG. 10.—St. Paul's, New York.

From the simplicity and reasonableness of these early buildings American architecture soon lapsed into a series of more or less extravagant and absurd departures, not to be accounted for on any ground more satisfactory than that of fashion or whim. It is perhaps not singular that this fall should be contemporary with the increase in the number of professional architects, ill prepared to meet the difficulties of practice in unfamiliar styles, yet ambitious to produce effects of novelty. The first fashion (for it can only be called such) to find general favor took the form of a Greek revival. Public buildings, churches, banks, and even private houses, were built after the similitude of a Greek temple, with a portico of two, four, or six columns at one end or both, but with the startling solecism of rows of windows piercing the walls. That the adoption of such a style for buildings to serve the ordinary purposes of modern life tied the hands of the architect, and deprived him of all freedom as to the disposition of his plan, was perhaps not less obvious to him than it is to us; but it was not a sufficient objection in his eyes to the use of the Greek model, which continued in favor

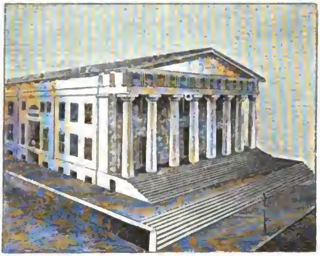


FIG. 11.—U. S. Custom-House, Philadelphia.

for many years. The custom-houses of Philadelphia (fig. 11) and New York, the former originally built for the United States Bank, are examples of the more splendid use of this style. Both are of white marble, with octastyle Doric porticos at either end. In the New York building the metopes of the frieze are plates of glass which light an attic story. The Boston custom-house (fig. 12) is an example of the same style used in a somewhat less unreasonable way. The porticos here occupy only the centre of each front, the order being carried around the building by engaged three-quarter columns. This building is of granite. But the final, crowning example of this singular misuse of architectural precedents is to be found in the Girard College at Philadelphia (fig. 13), of which the main building, finished in 1847, is at once the most splendid and the most preposterous ever raised in this country for educational purposes. It is in outward form a full Corinthian peripteral temple, 169 feet long, 111 feet broad, and 97 feet high, built throughout of white marble, the columns 6 feet in diameter and 55 feet high; the background of this magnificent colonnade being of course on all sides a cella wall pierced with three stories of windows, which admit an interrupted and insufficient light to the rooms within.

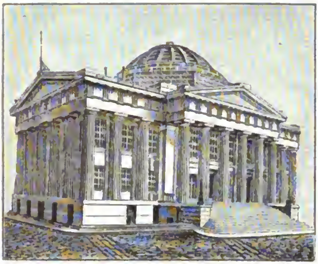


Fig. 12.—U. S. Custom-House, Boston, Mass.

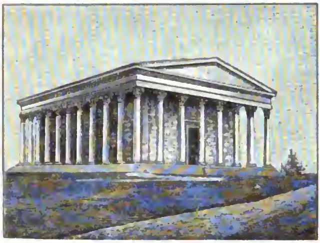


Fig. 13.—Girard College, Philadelphia.

The example set by the architects of important public buildings was duly followed in churches, town-halls, banks, and even in dwelling-houses, not only in cities, but also in country towns. Houses are still to be seen in the vicinity of all the larger cities whose front consists of a monumental portico of Ionic or Corinthian columns (the Doric was less common in domestic buildings, as being inconveniently massive) two or three feet in diameter, built up of pine planks, and surmounted with the correct entablature and pediment, the whole painted a dazzling white, only relieved by the bright green window-blinds.

The Greek fashion, absurd as it was, held undisputed sway for nearly a generation. Rude attempts were made from time to time at building churches in the Gothic style, but the results were for the most part so unfortunate that the older forms were generally adhered to until about 1840, when the building of Trinity Church in New York (fig. 14) set before the eyes of men the first worthy example of what might be done with the Gothic in the hands of a master. The master here was Richard Upjohn, English by birth, who came to this country in 1829, being then about twenty-eight years old, and settled in New Bedford, Mass., as a cabinetmaker, employing his evenings in teaching drawing. In 1832 he removed to Boston, where he worked as an architectural draughtsman, and even practised architecture in a small way, furnishing designs for small churches, of which St. John's at Bangor, Maine, is one. A few years later he became a resident of New York, and when it was determined by the government of Trinity Church to build a new edifice instead of enlarging their old one, Mr. Upjohn was employed—whether in competition or not we do not know—to furnish the designs. The church was built between the years 1839 and 1845. It was the largest and most costly religious building in the United States, measuring 80 feet in breadth and 192 feet in length, and with a stone spire 284 feet high. More than this, it was the first instance in which the Gothic style had ever been used in this country with knowledge and skill. Considered as the work of a man whose opportunities for practical work had been at best but limited, the result was most surprising. There is in Trinity

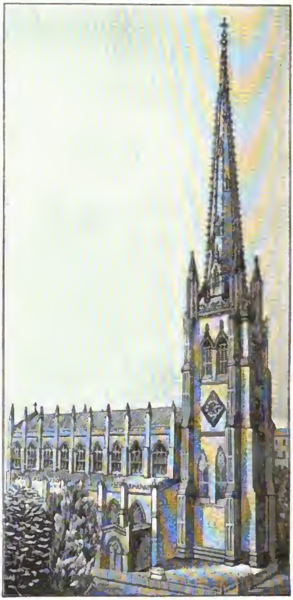


Fig. 14.—Trinity Church, New York.

Church no indication of an uncertain or inexperienced hand. The proportions are just, the construction is scientific, the details are well chosen and well placed. There is no striving for originality or picturesqueness. It is the work of a student who is contented to follow loyally the ancient models and to reproduce as closely as may be the ancient effects. But it would be too much to say that fifty years of rapidly-increasing knowledge and more rapidly-increasing expenditure have enabled us to produce a single church which can be pronounced the superior of this first work of an untrained and self-taught student. Mr. Upjohn continued in a large and varied practice for more than thirty years, building not churches only, but dwelling-houses and civic buildings of various uses. His buildings are widely scattered over half a dozen States, and while they are of course of unequal merit, they have all been designed with conscientiousness and refinement. It is, however, by his example of the use of the pure English Gothic in his churches that he has been of the greatest service to American architecture. The advantage of this influence was not immediately apparent. The classical style, which had furnished three generations of modest builders with churches in which dignity and propriety, not untouched with elegance, were joined with convenience and appropriateness, was abandoned for the newer style. The temple was forgotten; the cathedral was now the approved model. But the Gothic style was a much more complicated instrument than the Greek, and less governed by rules and proportions to be found in the books. In the hands of untaught architects it was capable of producing results more afflicting on the whole than those which had followed the use of the classic style. Only here and there a church or a chapel was built in which a little of the Gothic spirit was caught and preserved. But this was not all. As in the case of the Greek fashion twenty years earlier, so now the Gothic became a fashion, and houses, large and small, especially in the country, showed a tendency to become violently Gothic and to decorate themselves with sharp wooden gables and battlemented eaves and crocketed pinnacles. The absurdities of such a use of the style were, however, too apparent to be long persisted in, and Gothic became in a few years restricted mainly to churches, where it has prevailed as by common consent to the present day.

In the mean time, the condition of the people was changing with great rapidity. The growing cities, centres of commerce and manufactures, were developing in wealth and luxury. In this development a taste for architectural display occupied naturally a prominent place. Public and private buildings became yearly more ambitious and costly; the humbler materials which satisfied the builders of a generation before, like the classic models which furnished their modest façades, were far from satisfying their richer descendants. The broadening field attracted to the pursuit of architecture increasing numbers of men ready to style themselves architects and to undertake the duties of the profession, but whose training was for the most part limited to such as they could secure from their experience at the carpenter's bench. It was natural that under such conditions, among a people in whom the native sense of beauty is wanting, and while as yet no attempt had been made to supply that want by education, the architecture of the cities should soon present abundant examples of every form of ugliness and vulgarity which ignorance and ambition together could invent. Essays were made in every style known to history, from the Egyptian temple to the Swiss chalet. The introduction of cast iron as a building material dates from this period. The cheapness and rapidity with which castings of any desired pattern could be multiplied led to the adoption of this material to a considerable extent, not only for shop-fronts—where, the great end being the display of goods behind great sheets of plate-glass, the attenuation of the supports gained by the use of iron columns was a welcome advantage—but also for the entire fronts of buildings. An order of Corinthian columns with entablature at so much a pound was thus repeated as many times as the number of stories required, each story being an exact repetition of the one below. The iron being painted in imitation of marble and the spaces filled in with plate-glass windows, a certain grandiosity was attained, not procurable so cheaply in any other way. Numerous examples of this meretricious architecture are to be seen in almost every street of that portion of New York devoted to business, and the bad example was followed, though to a less extent, in some other cities. Fortunately, it was discovered before many years that this cheap splendor was in the long run expensive, the iron-work tending to deteriorate rapidly from rust, and requiring constant outlay to keep it in safe condition. This point settled, the progress of cast-iron architecture was brought to a sudden stop.

In the course of time, fortunately, the rapid material development of the country began to bring about a perceptible though inadequate education in matters of art. Foreign travel increased to a remarkable extent, and the splendors of the European capitals and cathedral towns became familiar to large numbers of those classes upon whom the production of architecture is dependent, while to those who did not travel abroad photography brought home the first adequate representations of the best buildings of all ages and countries. To these influences must be added the writings of Ruskin, not less widely read in America than in England, and not less immediate and powerful in their effect. It is easy at this interval of time to see the extravagances and fallacies with which these remarkable works were filled, but it is impossible to deny the influence which they exerted at a period of great degradation in art, in opening the eyes of intelligent people everywhere to the worthlessness of many of the things they had been used to admire, and to the beauty which it was possible to substitute. It is certain that large numbers of young and enthusiastic disciples were moved by the eloquence of Ruskin to take up the profession of architecture, and in their practice to contemn all building bearing the stamp of the Classic or Renaissance, to distrust every opening that was not covered by an arch, to regard with aversion all conventionalized ornament and all symmetry of parts, and generally to treat the question of one architectural style or another as a matter not of good taste, but of good morals. In the United States, as in England, the practical effect of all this was the general adoption of a modified Gothic style for civil and domestic as well as religious buildings—a style in which the pointed arch was *de rigueur*, in which much account was made of surface decoration by contrasting materials of different colors, and in which all sculptural ornament was realistic and dependent for the most part on the forms of flowers and leafage. One of the earliest and most successful examples of the new style was the build-

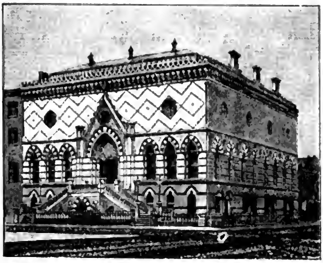


FIG. 15.—National Academy of Design, New York.

ing of the National Academy of Design (fig. 15) in New York, a work whose beauty of detail and material appealed strongly to the newly-awakened admiration of the Venetian architecture, from which its motives were mostly drawn. Many architects gladly adopted the style, and worked in it with skill and success, and most of the Northern cities present creditable examples of it, applied not only to public buildings, but to commercial street-fronts and dwelling-houses as well. But it had not the elements of permanent existence. It had served a good purpose in turning men's minds away from the falseness and ostentation of the prevailing styles of building, and teaching them to value honesty of material, delicacy of ornament, refinement of detail, above the tawdry splendors of the debased Renaissance architecture which had latterly contented them. Of the few important public buildings in which the Gothic style was used, one of the latest, as it is also one of the most conspicuous, is the State Capitol of Connecticut at Hartford (fig. 16), built of white marble with much elaborateness of decoration both outside and inside, and with a central lantern which is a compound of dome and spire, but missing withal the monumental character which belongs to a building of such scale and for such purposes. A more satisfactory example of Gothic applied to buildings for public use is the Memorial Hall of the Alumni of Harvard University at Cambridge (fig. 17)—a building with no costly materials or decoration, the walls being of common brick and the dressings of sandstone, but which, through a judicious use of these, and by a broad, vigorous, and refined treatment of the general design, acquires the serious and impressive effect which belongs to a public monument.

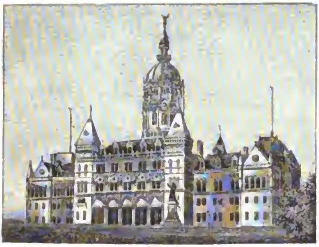


Fig. 16.—State Capitol Building, Hartford, Conn.

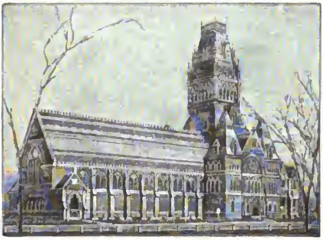


Fig. 17.—Memorial Hall, Harvard University, Cambridge, Mass.

Side by side with the influences which produced the revival of the Gothic style in civic buildings, and which proceeded wholly from England, was another quite opposite influence proceeding from France. For twenty years or more the United States have not been without a respectable representation in the architectural department of the School of Fine Arts at Paris. In this school the classic traditions are supreme, and its pupils who returned to America to practise their profession have loyally held to their allegiance and have designed after the manner of the French Renaissance. With rare exceptions all the numerous Government buildings, not only at the capital, but in all the cities—post-offices, custom-houses, court-houses, and the like—have been built in this style. The State and municipal buildings (fig. 18) have for the most part followed the same rule.

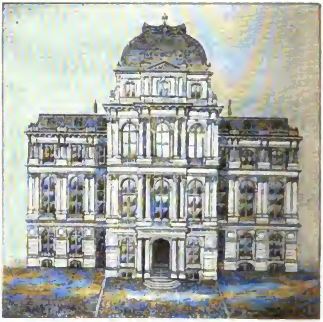
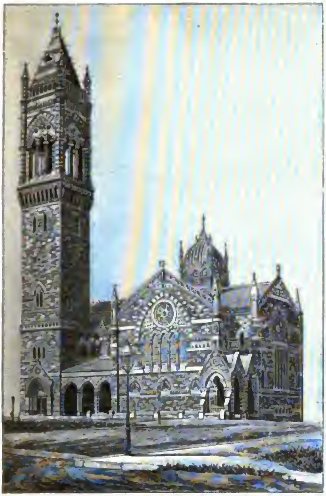


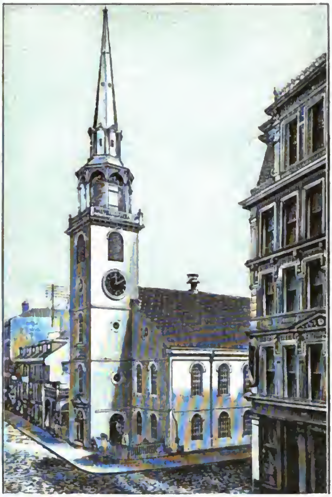
Fig. 18.—City Hall, Boston, Mass.

The main characteristics are alike in this whole class of public buildings: three or four orders of columns or pilasters superimposed, corresponding to the various stories, with Italian windows between, heavily ornamented; projecting pavilions at centre and ends, and a ponderous mansard crowning all, violently invaded by pediments and dormers and ornamental chimney-tops. The yet unfinished city buildings of Philadelphia (Pl. III) furnish a characteristic illustration on a magnificent scale of this ambitious style, which reached its fullest development in Paris under the patronage of Napoleon III. The new buildings of the State and War Departments (Pl. IV) at Washington offer equally characteristic and less extravagant examples of the same style, in which the almost invariable material is granite, and in which that enduring material lends itself readily to the expression of grandeur and solidity.

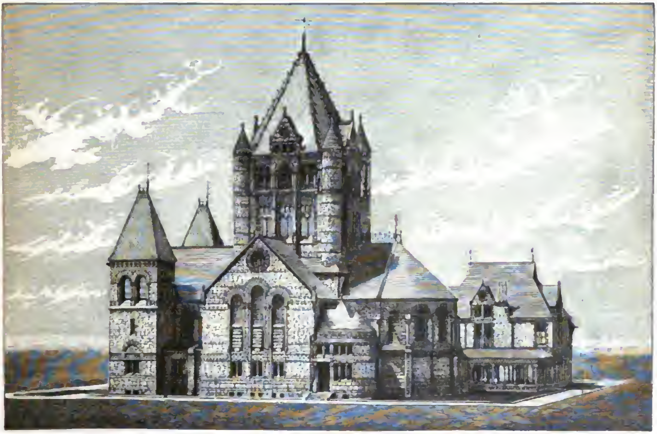
From what has been said it will appear that the architecture of the United States has been thus far the result of many successive external influences, contradictory, irreconcilable, transitory, rather than of any matured principles or convictions arising out of conditions of national life. In fact, the time for national individuality—if we may use such a term—in architecture, as in most other external matters, has passed. The solidarity of the race—of that portion of it at least among which political intercourse or social relations are maintained—has progressed too far for any exclusive eccentricity of style to flourish. The nations are too intimate with each other. As to architecture, this intimacy is constantly promoted by the rapid multiplication of photographs and the diffusion of illustrated architectural newspapers, by which the members of the profession are kept apprised of what is doing in other countries. England is especially active in publishing such journals, and as England is the one country of Europe in which the same absence of architectural principle and convictions prevails which we have spoken of above as prevailing in America, these papers have enough to do in setting forth the frequent changes in the fashion of building,



New "Old South" Church, Boston, Mass.



"Old South" Church, Boston, Mass.



Trinity Church, Boston, Mass.

which follow each other as often as any specially clever and audacious architect achieves some *tour de force* sufficiently striking to inspire his fellows with the desire to emulate his success. Such was the origin of the "Queen Anne style," so called, which followed a few years since in England the sudden abandonment of the Gothic, and was promptly, though less universally, adopted on this side the water, where all the caprices and extravagances of the latest English revival are emulated with ardor — the broken gables, the straight arches, the carved bricks, the lattice windows, and the numberless forms of laborious awkwardness which have no recommendation in usefulness or convenience, more than in beauty. It is perhaps safe to predict for this newest fashion a shorter favor even than its predecessor achieved, but what will succeed it no one can foretell. We may instance as examples of its more restrained and skilful use the new building of the Insurance Company of North America in Philadelphia (fig. 19) and that of the Union League Club in New York.

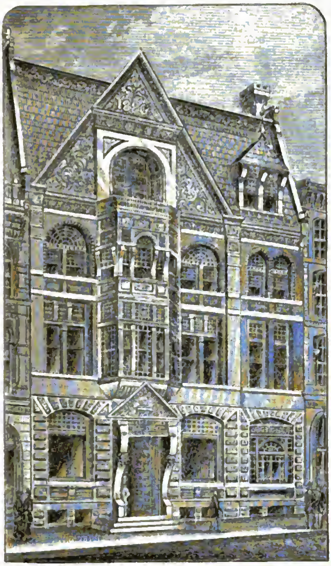


FIG. 19.

In church architecture less extravagance and uncertainty of taste has been shown than in public and private secular buildings. The Gothic style has been pretty steadfastly adhered to for now forty years, with occasional departures into the round-arched or Romanesque style. But during the period when Gothic was in favor for civil buildings, the Gothic as applied to churches underwent various modifications, notably such as were naturally induced by the study of Venetian types, as low-pitched roofs, bell-towers, surface decoration by materials of contrasted colors—features characteristic of the Gothic of Northern Italy rather than that of England, from which the motives of the earlier churches had been drawn. This was, however, not the case in the largest and most elaborate and costly religious edifice yet undertaken in the United States, the Roman Catholic cathedral in New York. In this church, whose scale is very nearly that of a European cathedral, measuring in length 306 feet and in breadth at the transepts 140, the design follows, not too closely, the type of Gothic prevailing in France in the fourteenth century. Its west front has a central gable 156 feet in height, flanked by two exactly similar spires 330 feet high. The transept ends are of similar design, but without spires. The aisle-walls are flanked with deep buttresses, which seem to have started with the expectation of sustaining flying buttresses, and we believe it was indeed the original intention to cover the nave with a brick vault with stone ribs, and to meet the thrust by flying buttresses, but a plaster ceiling having been substituted, the outside support was abandoned. The interior of the cathedral is carried out in general with a worthy adhesion to the old traditions. The nave-piers are of white marble, and carry a high clerestory pierced with broad windows divided by decorated stone tracery and filled with fine glass. A triforium runs around nave and transepts; the high altar is surmounted by a marble tabernacle, and backed by a marble and alabaster reredos of great elaborateness; the pavement of the church is of tessellated marble-work. It will thus be seen that no effort or expenditure has been spared to make here a real cathedral. Yet the effect is disappointing. A cathedral of the Old World presents to the mind the idea of growth. This American cathedral presents rather the idea of manufacture. The form is here, but the spirit is wanting. To say that the marble of the modern church is not alive with sculpture like the stones of Rheims or Chartres is but to touch the truth. The cathedral of the Middle Ages grew out of the institutions and life of the people. The cathedral of the nineteenth century is but the visible sign of conditions of life which are obsolete. No closeness or completeness of imitation could invest the new work with the charm of the old. The imitation which is excusable in Catholic churches is less pardonable in those of the Protestant faith, where church buildings are no longer the monuments of the power of the Church, but houses erected for the practical uses of a public worship which grows every year more simple, and in which the first necessity is that the words spoken by the preacher shall be clearly heard by all his congregation. Yet in the Protestant churches of America, thus far, the chief ambition of the architects has seemed to be, in most cases, to retain as many as possible of the characteristic features of mediæval church architecture. The cathedral nave and side-aisles, divided by great piers or columns which shut out the sight of the pulpit from a third of the pews, are in a Protestant church unreasonable, not to say absurd. So is the high-pitched, gloomy roof, which absorbs the voice of the preacher and the light from the windows. So is the darkness, which makes it difficult to read the service-book. Yet these and others like them in unreasonableness are features which the modern church architects, generally speaking, have thus far found too fascinating to be laid aside. In exceptional instances, however, it has been shown that an impressive and beautiful interior can be produced without the aid of such solecisms, as in Trinity Church at Boston (Pl. V), perhaps the most striking and successful attempt to domesticate a somewhat unfamiliar type of Romanesque architecture, whose noble central tower, 56 feet square, is a reminder of the twelfth-century churches of the south and west provinces of France, and in whose interior the division into nave and aisles has been frankly abandoned in favor of that free open space which the modern forms of worship demand. To meet peculiar requirements, which seemed to call for marked divergence from the usual forms of church building, essays have been made with more or less success according to the individual tastes and abilities of the architects. A noteworthy example of this is the Jewish "Temple Emmanuel" in New York, built about 1860, in which many of the features of Saracenic architecture have been employed with much skill and vigor and with a lavish use of costly materials. The interior is extremely sumptuous, but the outside effect, though showing much graceful detail, is less satisfactory.

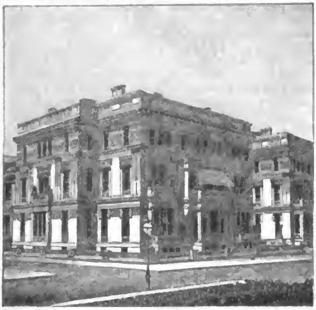


FIG. 20.—Vanderbilt Houses, New York.

It is, after all, in domestic architecture that we must look for whatever characteristic national expression we may expect to find in the architecture of the United States. In the large cities the division of estates and the increasing price of land have resulted in a continual narrowing of house-lots, until, unless in exceptional cases, the city house has become a mere slice, all length and height—the most unreasonable, uncomfortable, and unattractive of all known types of civilized dwellings. With all the ingenuity and invention bestowed by clever architects on its plan and its design, this house refuses to lend itself with readiness to the expression of that broad, cheerful, hospitable family life which is before our minds when we speak of domestic architecture. There has, however, been a vast amelioration even here. The style of city dwellings invented by New York builders during the dark period between 1840 and 1860, whose gloomy monotony has impressed itself on many miles of New York streets, where the close-set ranks of brownstone houses, all exactly twenty-five feet wide, with their high break-neck front steps, their flat roofs, their exaggerated cornices and door- and window-dressings in the worst Italian style, have the air of having been turned out of some gigantic building-mill,—this type of city dwelling, vulgar, pretentious, costly, and uncomfortable, though it has not yet disappeared from New York, has ceased to be recognized universally as the correct thing, has been utterly outgrown by the architectural profession, and left as the instrument of speculative building mechanics. Of the modern houses built under professional direction, whatever other criticism may be made, monotony can certainly not be charged upon them. The resources of the modern architectural student and the diversity of individual tastes among the profession are nowhere more forcibly illustrated than in this department of their work. It is to be said in favor of an encouraging view, that while a cool and instructed observer cannot fail to see in the new houses a certain wildness and lack of reserve and self-restraint in the use of the unbounded material at the command of the architect—especially an intemperance in the use of ornament both outside and inside—still, there is a visible tendency to return to the forms of the better periods where these evidently conduce to domestic comfort. Thus we see now low entrance-steps in place of the palatial flights of a generation ago, lower stories, broader windows, broad and square-framed stairways, ample fireplaces set in mantels of wood instead of the cold and tasteless marbles of the bad age. The group of houses recently built nearly simultaneously for the various members of the Vanderbilt family in New York afford a good illustration of the various directions in which different architects have been drawn by their individual preferences. The most extensive of these follows the severely formal style introduced in the German capitals, notably in Berlin, by the older architects of the present generation—a style characterized by rigid classicism of detail, squareness of outlines, flatness as to projection. The restraint imposed by such a style has made this the most satisfactory of all the Vanderbilt houses (fig. 20). In all the others, especially, perhaps, in that which affects the style of Francis I., the effort for splendor is too apparent; the architect is oppressed with the magnitude of his opportunity, and loses that reserve and self-control which are never so necessary as when an unlimited expenditure seems to warrant the architect in disregarding them.

In houses of less pretension the same diversity of styles is shown, and an equal diversity in size, material, situation, and costliness. The house which has but the usual frontage of twenty-five feet, more or less, offers small opportunity for the development of any pronounced style, and the wise architect will in such a case limit his effort to producing a front not too obtrusive on the one hand nor too inexpressive on the other, but which shall satisfy the eye by the completeness of its adaptation to the needs of the interior and by temperance and elegance in detail. Corner-lots offer of course an opportunity for composition

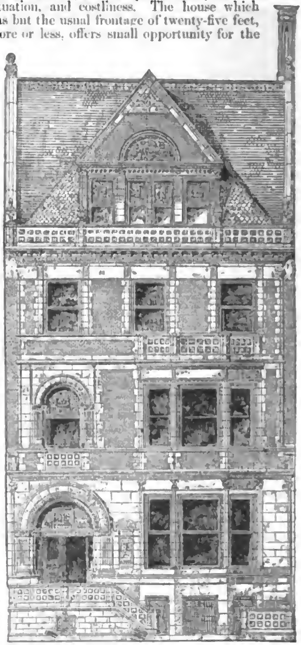


FIG. 21.—Dwelling-house in New York.

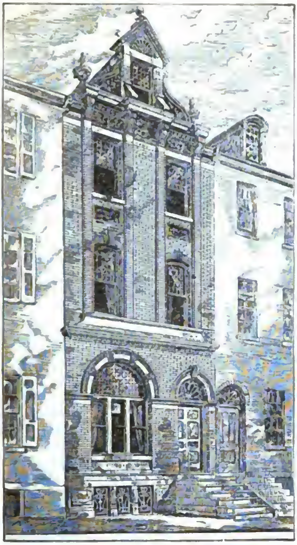


FIG. 22.—Dwelling-house in Philadelphia.

which seems to justify a more ambitious effort. Figs. 21, 22, 23, 24 illustrate various more or less successful attempts in various cities to solve this interesting but difficult problem.

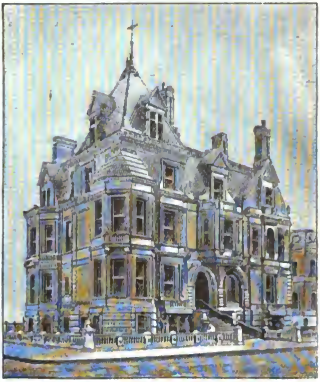
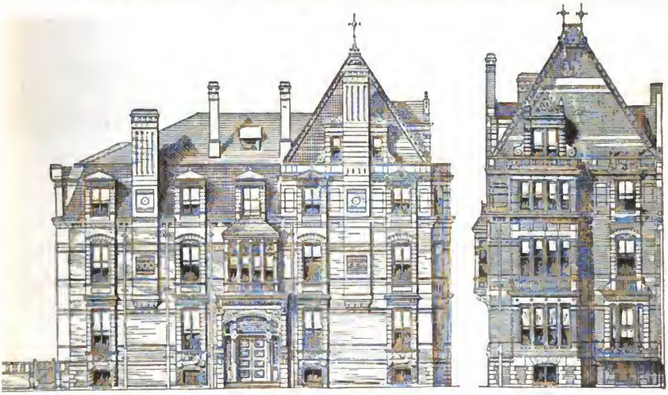


FIG. 23.—Dwelling-house, Boston, Mass.

The rapid multiplication of apartment-houses in the larger cities brings large masses of building under the hand of the architect (fig. 25). These houses, like the *hôtels privés* of the European cities, call for great ingenuity in planning, but offer a difficult problem to the designer, who, constrained by the necessity for covering all the land available, and by the multitude of windows required, finds it difficult to avoid a certain flatness and monotony of effect.

In country-houses, though we cannot look for greater diversity of taste and style than has of late been illustrated in the streets of the cities, there is naturally a vastly greater variety in plan and disposition, resulting from the ampler space at the command of the architect. Mr. A. J. Downing's book of designs for country-houses, published about 1850, and Mr. Vaux's, of similar character, which appeared in 1859, had much to do with the education of popular taste in this interesting



Front Elevation. FIG. 24.—Dwelling-house in Boston. End Elevation.

department of building; and this influence was timely, falling just at the beginning of the general educational movement above spoken of. The common use of wood as the material of country-houses has drawn a broad line of distinction between those of our own country and those of almost all other parts of the world—a distinction still further broadened by the general use of verandas, piazzas, or galleries, as they are variously called in the various portions of the country. The wooden-framed walls, however, although from their cheapness they must long continue to be the rule among detached country-houses, are by no means so much a matter of course as they were a generation ago, stone and brick having come much into use with the increased expenditure now becoming common. Often a combination of the two methods is used, the first story being carried up in brick or stone with a wooden framing above. In spite of the superior permanence, solidity, and safety from fire of walls of masonry, the wood-framing covered with tight boarding, and again with clapboards or shingles, with a layer of felting or sheathing-paper between, has undoubtedly the advantage of greater warmth and dryness—a substantial superiority in the northern portions of the country, where the winters are long and severe. Figs. 26, 27, 28 are examples of the treatment of wooden country-houses in recent years. The plans of country-houses of the better class have now developed far beyond the compact cubical arrangement of earlier times into great irregularity and extent. This is especially the case with a class of houses which may almost be said to have been created within the last twenty years, the class of summer-houses—houses built at the seashore or in the country for use only during the summer months. Newport, the shores of Massachusetts Bay, the various summer resorts of the New Jersey coast, offer innumerable examples of the most various and interesting character, many of them exhibiting great beauty and picturesqueness of effect, and many others distinguished only by extravagance, pretension, and the absence of every quality which goes to make a worthy design.

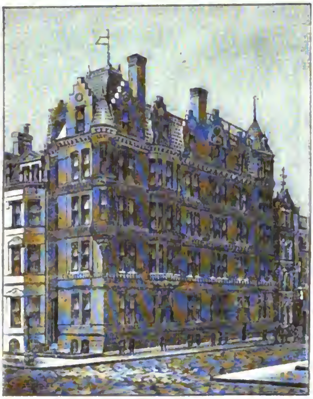


FIG. 25.—Small Apartment-house.

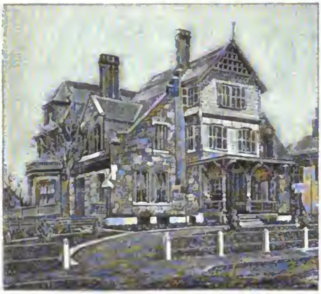


FIG. 26.—Dwelling-house at Cambridge, Mass.

The field of interior design has been much extended within a few years by the prominence given to the study of decoration. So lately as even a dozen years ago the decoration of interior walls and ceilings in churches and public buildings was confined to covering them with flat tints of color in oil or in distemper, with the addition of an occasional band of stencilled geometrical ornament of extremely conventional character to mark the principal divisions of the parts. The same might be said of dwelling-houses, except that more variety of subject and color was given to the walls by the use of wall-paper, which had come to be produced of admirable quality. All this is now changed. A new taste has been created, which grows by what it feeds on, and which is fed in the most abundant, not to say extravagant, manner by a new class of purveyors—the class of professional decorators, whose work includes that of both artist and artisan. New colors have been devised, new stuffs invented; wood-carving, brick-carving, terra-cotta, tiles, metal-work, stained glass, the manufacture of wall-papers and fabrics of cotton, wool, and silk for hangings, have received an immense impulse; every surface is decorated, every panel is carved; mantels and sideboards are made with shelf above shelf to receive the innumerable jars and vases and plaques of bronze or china which are now poured into the country from France, from England, from Japan, from China, to appease the insatiable appetite of a people rudely awakened to its previous shortcomings in matters of taste and determined to make good all deficiencies. This remarkable movement,

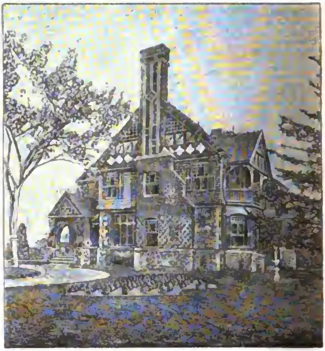
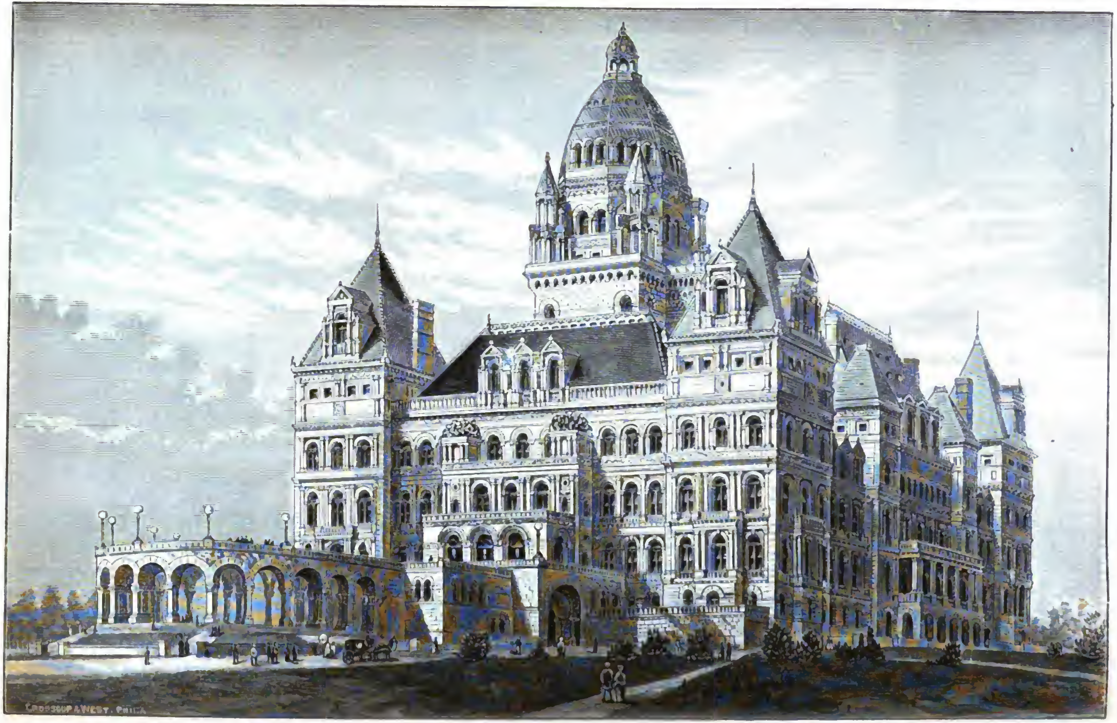


FIG. 27.—Dwelling-house in Dorchester, Mass.


Crosscup & West. Phila.

State Capitol Building, Albany, N. Y.

which had its origin in the vigorous protest of a few artists in England against the prevailing absence of good taste in matters of house-building and house-furnishing, has been of incalculable service, and has resulted in a very great and general increase of knowledge and good taste among architects and all who have to do with these matters. But the movement has also its ridiculous side, and is in danger of making our houses by so much less attractive and excellent than they were a generation ago, as vanity and pretence are worse than honest ignorance. Probably the evil will in time work its own cure.

Trinity Church at Boston furnishes perhaps the first example of a completely and consistently decorated interior. It has been generally held that color-decoration on walls and ceiling is incompatible with windows filled with stained glass. In Trinity Church the windows are entirely filled with very rich glass, and the decoration of walls and ceiling is nevertheless carried out in a scheme of color for which no light could be too strong or clear. There is no lack of harmony between the walls and the windows, and the only ill effect of the combination is in the occasional difficulty of making out some of the interesting details of figures or flower-work. In the yet unfinished Capitol at Albany, N. Y. (Pl. VI), much elaborate and costly decoration has been lavished on the legislative chambers, particularly the Assembly-room, but, although there is here no stained glass, the effect is much less satisfactory than in the case of Trinity Church. This chamber is covered with a stone vault, the faces of whose stones have been covered with a pattern in positive color, which would have been suitable enough on a plaster ceiling, but which is tawdry and vulgar when applied to stone-work. Furthermore, on the faces of two opposite side-walls of the chamber two large spaces above a row of windows, and enclosed by the circular vault of the ceiling, are filled with two noble though ambitious allegorical pictures by William M. Hunt, the position of which renders them practically invisible. On a smaller scale, the principal apartments of the new building of the Union League Club in New York have been treated with great skill and richness by several decorators in a manner which illustrates fully the latest theories on this interesting subject.

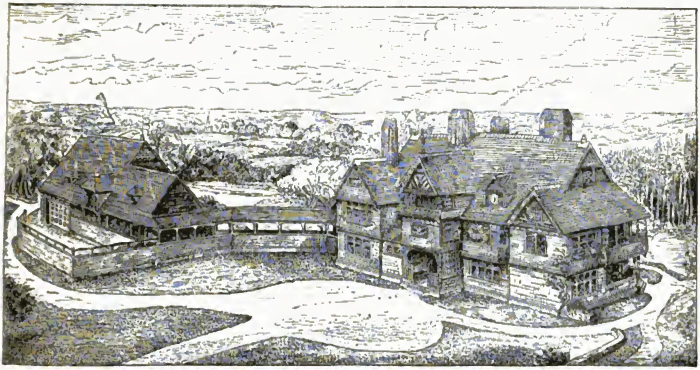


FIG. 28.—House at Manchester, Conn.

From what has been said it will be manifest that much activity of mind and much intellectual and artistic capacity are characteristic of the architectural profession at the point which it has already reached. We have noted the variety of styles of which our cities and towns afford examples. So much variety of style does not necessarily imply variety of accurate knowledge. It implies, perhaps, rather an unfixed taste, a restless seeking for novelty and sensation, characteristic of a community with whom the sense of beauty and fitness in art is not natural, and with whom education has not yet supplied the lack of natural endowment. If the architects of the present day are better fitted than they have ever been before to meet the constantly increasing demand for competent work, the result has been attained by the progress made in intelligent methods of professional education. The means through which such education is supplied are growing every year more ample, though they cannot yet be called adequate or satisfactory. The first school of architecture in the United States was established as a department of the Massachusetts Institute of Technology at Boston in 1866. This was followed by similar schools at Cornell University, the Illinois Industrial University, the Universities of Pennsylvania and Michigan, and later at Columbia College at New York, where the architectural department forms a portion of the School of Mines, and is probably more liberally provided for as to funds than any similar school. Courses in architecture are made a part of the undergraduate studies in the College of the City of New York, in the colleges at Princeton, Syracuse, St. Louis, and perhaps others. The methods pursued in these schools doubtless vary widely according to the tastes and education of those having them in charge. In the oldest of them, that at Boston, the teaching has held for the most part to the traditions of the School of Fine Arts at Paris. Greater freedom may have prevailed in other institutions, but in all the aim, and to a certain extent the result, has been the same—to guide the wandering and diffusive tastes, and to fix them in accordance with those governing principles which are equally binding on the designer whatever the style he may choose to express himself in. The leaven of such teaching has visibly affected the multifarious architecture of the Northern cities and towns, refining the crudeness of a dozen years ago, and bringing into practice great numbers of active-minded and trained young men capable of using with knowledge and discretion the unlimited mass of precedents which goes on accumulating from year to year.

The rapid increase in numbers and importance of the architectural profession suggested the need of some organization which should facilitate and encourage a closer professional intercourse and a better understanding among the members of the architectural body in the various cities than had been possible without some such aid. In 1867 the American Institute of Architects was founded, with the view of associating as many as possible of the architects of good standing in all parts of the country. It was soon found, however, that the practical advantages of a single organization like the Institute were chiefly limited to those afforded by an annual convention of its members and by the publication from time to time of such papers or communications of general interest as might be contributed to it. It was desirable to add to these undoubted advantages the more direct benefit to be derived from more frequent meetings and closer personal fellowship. This was supplied by local associations in the various cities, each with its own independent organization and its own plan of action. These societies were one after another enrolled as chapters of the Institute, and their members became associate members of that body. The connection between the local societies and the central body has not proved as intimate as could be desired, being for the most part limited to the sending of reports from the chapters to the annual conventions of the Institute, which are held in the various cities, and to the distribution, among the chapters, of the printed proceedings of the conventions. But even this connection has not been without its advantages to the profession, of which the rise is still so recent, and the appreciation by the general public even yet so incomplete, that its members need all the strength and confidence which come of union among themselves and of substantial agreement as to methods and rules of practice. (C. A. C.)

ARCIMBOLDI, Giannangelo (d. 1555), an Italian archbishop, belonged to a distinguished family which had originally resided in Parma, but removed to Milan in the fifteenth century. He was admitted to the college of noble jurisconsults in Milan about 1508, and in 1514 was sent by Pope Leo X. to Germany to raise funds for the Church. He carried on a large traffic in indulgences at Lubeck, and, going next to Denmark, was engaged by King Christian II. to further his political schemes. In 1518 he entered Sweden and distributed a large number of letters of indulgence, some of which are still extant. In accordance with Christian's wishes, he at first endeavored to undermine the power of Sten Sture, and especially to secure the reinstatement of Archbishop Gustaf Trolle, who had been imprisoned by Sture. But the latter found means to win the pope's legate to his side, and the king then tried to capture Arcimboldi, who escaped to Germany, and thence returned to Italy. He was made a senator by the duke of Milan, and employed in various diplomatic missions. In 1523 he was made bishop of Novara, and in 1550 archbishop of Milan. He died at Milan, April 6, 1555. Other members of the family held prominent positions in Church and State. The family became extinct in 1727.

ARCTIC EXPLORATION. The ten years following 1872 have shown general activity on the part of the several enterprising maritime nations in the exploration of the Arctic seas, and, while the North Pole remains unreached, considerable additions have been made to the volume of circumpolar geography. The most notable voyages during the period named will alone be considered in this article.

The cruise of the Tegethof is the most notable of Austrian exploring expeditions. Little was accomplished worthy of record until after August, 1872, when the Tegethof and Isbjörn parted company. The Tegethof, under Lieuts. Weyprecht and Payer, made an unsuccessful attempt to pass around Cape Chelyuskin, and along the northern coast of Asia to Behring's Strait, but they finally reached a point farther north than had yet been visited by man. In August, 1873, after many vicissitudes, the Tegethof sighted land in 79° 43′ N. lat. and 60° 23′ E. long. She continued to drift northward, passing the 80th parallel, until the ice-floe upon which the vessel had been immovably fixed for fourteen months was driven on an island. Here the long Polar winter of 175 days set in, and the cold became so severe that the quicksilver remained frozen for weeks, while the darkness in mid-winter was intense. Lieut. Payer made sledge-journeys to explore the new land, which they named Franz Josef Land and found its area to be about that of Spitzbergen. It resembles East Greenland, and is in two large masses east and west; one of which is called Zichy and the other Wilczek Land, after Count Wilczek, the Arctic explorer and munificent patron of the expedition. It is a land of desolation; mountains rise to the height of 5000 feet, with vast cliffs between filled with gigantic glaciers. Reaching 81° 37′ N. lat., they came upon a territory which they called Crown-Prince Land, where they found the cliffs covered with thousands of ducks and auks; seals, bears, hares, and foxes also abounded. Here too was open water. The farthest northern journey was completed in the following April, when they followed the coast to 81° 57′ N. lat. over a sea comparatively free from ice, and saw land in the distance which seemed to stretch beyond the 83d parallel. This land, the most northern then known upon the globe, they named after Petermann, the German geographer. In May, abandoning the vessel and their journals, they started on their return journey, during which they suffered great hardships. At the end of three months they sighted a Russian schooner at the mouth of the Prihova River, and were conveyed to Wardoe in Norway. It is remarkable that while in other attempts to reach the Pole, where vessels have been caught in the ice and drifted, the drift has usually been southward, the Tegethof drifted northward. Lieuts. Weyprecht and Payer regard the theory of an open Polar sea as preposterous, but a variety of theoretical thermal gateways to the Pole are suggested by the facts ascertained upon this most important expedition. It also supported the opinion of the most enlightened geographers, since confirmed by the disastrous fate of several Arctic enterprises, that the only practicable route to the Pole is by way of Smith's Sound.

Sir George Nares's Expedition.—In 1875 the British Government equipped with lavish expense two vessels, the Alert and the Discovery, furnishing them with every appliance known to Arctic travel or suggested by experience and forethought. They were placed under the command of Sir George Nares, who had been knighted for his geographical work during the extended cruise of the Challenger. The vessels had great difficulty in forcing their way through Smith's Sound and Kennedy's and Robeson channels. It required the greatest carefulness and most skilful seamanship. The vessels were 25 days in making a distance of 250 miles, and very narrowly escaped being nipped. The Alert finally reached 82° 24′ N. lat., the highest point ever attained by a vessel, and the sledge-expedition under Capt. Markham 83° 21′ 26″ N. lat., the extreme northern point reached by man. This expedition discovered and traced a line of coast extending over nearly thirty-eight degrees of longitude; ascertained to a considerable extent the nature of the Polar Sea bordering this newly-discovered coast; and collected a large amount of scientific information. Commander Aldridge explored a line of coast 230 miles west of the spot where the Albert wintered, 90 miles of which trends north-west to Cape Columbia, the extreme northern cape, 83° 7′ N. lat., 70° 30′ W. long.; thence westward for 60 miles to 79° W. long.: thence gradually south to 82° 16′ N. lat. and 83° 33′ W. long., with no indication of land extending thence either westward or northward. Commander Beaumont with his sledge-party traced the north-west and northern coasts of Greenland from Polaris Bay to a point east of Mount May, in 50° 40′ W. long., where he sighted the farthest northern land seen in the expedition, in 82° 54′ N. lat., 48° 33′ W. long.—Cape Britannia and Mount Albert—and found that the Greenland coast runs from Mount May in a south easterly direction beyond the 82d parallel. Lieut. Archer explored Lady Franklin Bay, and Lieut. Fulbord and Dr. Coppinger Petermann's Fiord and its vicinity. To these discoveries must be added magnetic, meteorological, and other scientific observations carried on in the winter. All of the important work was performed under the most trying circumstances. The expedition passed an Arctic winter of 142 days, enduring the most extreme cold yet known, the temperature falling at one time to −73°. During Capt. Markham's sledge-journey in 1875 to Cape Joseph Henry the snow was up to the waists of the men, who were obliged to draw the sledges through it. They had also to draw two heavy boats 20 feet long over rugged floes of ice separated by ridges often 30 feet high, and to make their way over the débris of pack-ice broken up by the previous summer and refrozen during the winter into angular blocks of every conceivable shape. They had frequently to cut their way with picks through the hummocks; and such were the hindrances that they had frequently to go five times over the same ground, so that in making a distance of seventy-six miles toward the Pole they actually travelled over 276 miles. Each man had to drag 236 pounds and to work from ten to twelve hours a day. They could pull but a few feet at a time, and make only from 1¼ to 2¾ miles a day. On this sledge-expedition they were engaged in incessant labor for two months and a half; and, to add to their trials, scurvy broke out, so that when relief reached them, out of seventeen of the party only five were able to draw sledges. A significant fact in connection with this expedition is that while it was commanded by the Admiralty to remain away two years, it returned to England after a year's absence, to encounter a storm of unfavorable comment and to provoke many unwarranted controversies, chief of which was the effort to discredit the narratives of the leading American explorers, Dr. E. K. Kane and Dr. I. I. Hayes.

Voyage of the Pandora.—In 1874 the Pandora (which subsequently became the Jeannette) was fitted out at the expense of Lady Franklin, James Gordon Bennett, and Capt. Allen Young with the object of exploring King William Land and making more thorough search for the relics of Sir John Franklin's expedition. The steamer, under command of Capt. Young, passed through Melville Bay and entered Lancaster Sound, where a formidable ice-barrier was found. On Beechey Island, Capt. Young found the yacht which Capt. Ross had drawn up there in 1850 as a storehouse for ice-bound sailors, but depredations by polar bears had caused the structure to decay. He also found the monument of Lieut. Bellot, who had lost his life in the search for Sir John Franklin, and the head-boards over the graves of Franklin's men still upright. Capt. Young then proceeded to Peel Sound, where he encountered large fields of pack-ice, through which, however, he worked his way, going farther in those waters than any previous explorer; and, had he found open water, he would have tried to make the North-west passage.

The Jeannette Expedition was equipped in 1879 by the joint enterprise of the U. S. Government and of Mr. James Gordon Bennett of New York. Its disastrous and melancholy end has made it famous in the annals of Arctic exploration, but it was wellnigh fruitless in contributing to our knowledge of Polar geography. The Jeannette sailed from San Francisco in July, 1879, with 32 men, under the command of Lieut. De Long, U. S. N., his associate officers being Lieuts. Chipp and J. Danenhower and Engineer Melville. The scientific staff consisted of J. J. Collins, R. L. Newcomb, and Mr. Brooks. The record of the voyage is extremely monotonous. Two months after her departure the Jeannette entered the ice-pack, from which she never escaped. She finally went down June 13, 1881, about N. lat. 77° 18′ and E. long. 153° 25′. The survivors retreated along the ice southward, and finally embarked in their boats, two of which reached the delta of the Lena. Of Capt. De Long's party, two seamen, Noros and Ninderman, reached St. Petersburg; the rest, thirteen in number, perished, but their bodies were subsequently found with journals detailing their terrible sufferings. Engineer Melville's party was saved, but that of Lieut. Chipp was never heard from. No official account of the expedition has yet been published.

During the absence of the Jeannette the U. S. revenue steamer Corwin was sent in quest of tidings up Behring's Strait, but she was unable to reach Wrangell Land. The Rodgers, under command of Lieut. R. M. Berry, sailed from San Francisco in June, 1881, reached and thoroughly explored Wrangell Land, but did not discover the Jeannette. The Rodgers was finally burned to the water's edge, and Col. Gilder, who had accompanied her, made an overland journey from Behring's Strait, where she was destroyed, to Irkutsk.

Discovery of the North-east Passage.—The steamer Vega, under the command of Baron Nordenskjöld, has accomplished the work so long attempted by many brave explorers, the discovery and navigation of a north-east passage by sea from the North Cape, the extreme north-western point of Europe, to the East (or Vastatchni) Cape, the extreme north-eastern point of Asia, or, in other words, a passage by sea from the North Atlantic Ocean eastward into the North Pacific Ocean. The solution of this great geographical problem was the result of a carefully executed plan based on the experience and knowledge of its projector. To the enterprise the baron devoted many years of thought and conscientious investigation, collecting all information that could be obtained from whalers and other Arctic navigators, undertaking himself several tentative voyages to the north, with his ultimate end kept steadily in view. In 1875 and 1876 he accomplished two voyages to the mouth of the Yenisei River, the expense of these being borne by Mr. Oscar Dickson, a merchant of Gothenburg, and Mr. Sibereakoff, a large landholder in Southern Siberia, to both of whom a trade-route from Northern Europe to the great Arctic rivers of Asia would be of advantage. The comparative ease with which these two voyages were accomplished led Nordenskjöld to push on with renewed vigor and enthusiasm toward the great object of his life. He was supported by Oscar II. of Sweden, and was enabled to equip the steamer Vega in the most complete manner for a three years' scientific voyage. In July, 1878, he left the harbor of Tromsoe. Capt. Polander, of the Royal Swedish navy, was second in command and the actual captain of the vessel. There were on board several botanists, zoologists, and meteorologists. Besides these gentlemen there were officers of foreign navies, who at the request of their respective governments were permitted to accompany the expedition. Among these was Lieut. Bove of the Italian navy, who had been appointed by his sovereign to command a projected Antarctic expedition. From the sailing-master to the humblest servant the crew was picked, and probably no expedition ever sailed better equipped for such a purpose. The Vega was accompanied on the outward voyage by the steamer Lena, which was to accompany her as far as the delta of the Lena River. Doubling the North Cape, the ships proceeded first to Nova Zembla, and, passing through the Yugor Schar, or straits which separate Vaygatz Island from the mainland, entered the Kara Sea. (Under this name, it should be noted, Nordenskjöld includes the whole of the vast gulf which lies between the extreme north of Nova Zembla and Cape Chelyuskin, the northern point of the continent.) At the end of July the ships of the expedition met in Chabarook, the appointed rendezvous. Besides the Vega and the Lena, two others, the Frazer and the Express, were to go up the Yenisei River with cargoes of iron-ware and bar iron, and return the same season to Norway—a plan which they successfully carried out, reaching Hammerfest in September with full cargoes of tallow, wheat, rye, and oats, the first shipments brought out of the Yenisei into European markets. The details of their voyages, given in Nordenskjöld's volume, make many interesting additions to our geographical knowledge. The Lena, having accompanied the Vega around Cape Chelyuskin, ascended the Lena River to Yakutsk, making a successful voyage. The information gathered by the three ships and deduced from their experience in trade has an important bearing upon the probable commercial relations of Northern Asia with the rest of the world. On August 19th the Vega anchored off Cape Chelyuskin, and this event, unexampled in the history of navigation, was marked by hoisting colors, firing salutes, etc. Steering eastward, the Siberian islands were reached on the 26th, and here great quantities of mammoth ivory and other mammoth remains were found. Sailing again eastward, they approached the narrow passage that separates Asia from America, and then, by what Nordenskjöld regards as a most unfortunate accident, the ship was beset by the ice at the entrance to Behring's Strait, Sept. 28. Here she lay imprisoned until July 18th of the following year—311 days, the greater portion of which time was spent in almost total darkness. Nordenskjöld utilized it, however, in visits to the friendly natives and in making observations and digesting the results of his voyage. On July 18th the ice was found to be in motion, and, the fires being lighted, at 3.30 P. M. the ship moved off. At 11 on the following day she was in the middle of Behring's Strait: the north-east passage was an accomplished fact. Thence the homeward journey was made by way of Japan, Ceylon, and through the Suez Canal. Nordenskjöld returned to Europe to receive the most distinguished marks of honor for his signal triumph.

Minor Notices.—In 1874–75, Capt. Gunderson, of the schooner Regina, discovered on the north coast of Nova Zembla the journal kept by Barentz, the famous Dutch navigator of the sixteenth century. Its last entry was dated June 1, 1580, and the journal was in excellent preservation.

In the year 1875 the scientific results of the Polaris expedition, made under the direction of the U. S. Government and the Smithsonian Institution, were published. This little schooner had reached the high latitude of 82° 16′ N., and Capt. Tyson and his companions subsequently made a perilous voyage of 1500 miles southward on an ice-floe until rescued by the Arctic steamer Tigress.

In 1877, Capt. Wiggins made a voyage in a steamer through the Kara Sea, and proceeded to the Gulf of Obi, but was prevented by strong currents from ascending the Obi River. He then sailed for the Yenisei River, discovering on the route many magnificent islands covered with verdure, abounding in reindeer, and having good natural harbors. He ascended the Yenisei with his vessel to the mouth of the river Kureika, which is a little south of the Polar Circle. Leaving his vessel there, he went by sledges to Yeniseisk, pushing through a magnificent forest with trees of immense size.

M. Sibereakoff at his own expense undertook the exploration of the Angara River later, and at the same time Dr. Onatsevitch, of the Russian navy, was engaged in Eastern Siberia and the Sea of Okhotsk. Beyond the East Cape, in 67° N. lat., he went a westerly course instead of making the passage by way of Behring's Strait.

In 1878 the Dutch also embarked an Arctic exploration, equipping the William Barentz, a sailing schooner of 79 tons. The cruise of this vessel has given additional knowledge of the ice movements between Spitzbergen and Nova Zembla.

In the summer of 1878, Capt. Moria, of the Danish war-steamer Ingulf, sighted the farthest land reached on the east coast of Greenland by Scoresby in 1821. Capt. E. Johannesson penetrated a considerable distance east of Nova Zembla, in 77° 35′ N. lat. and 66° E. long., discovering an island ten miles long in 77° 55′ N. lat., level and free from snow, containing many varieties of birds. In 1878 also Capt. A. H. Markham, R. N., and Sir Henry Gore Booth, in the Norwegian cutter Isbjörn, succeeded in rounding Cape Nassau, going as high as 78° 24′ N., or within 80 miles of Franz Josef Land. The schooner Eothen, commanded by Lieut. Schwatka, assisted by Col. W. H. Gilder, reached Dépôt Island, to the north of Hudson Bay, in August, 1878. Important surveys were made, and an extended sledge-journey to King William's Land also. A river running N. W. about 100 miles was discovered by Col. Gilder.

In 1880–81 the most important additions to geography were made by B. Leigh Smith along the south coast of Franz Josef Land, for which he received the highest honors of the Royal Geographical Society. In June, 1881, Mr. Leigh Smith started on his fifth voyage to the Arctic regions in his own steamer, the Eira, from which no authentic information has yet been had (1883). A relief expedition has been sent in quest of him. (A. S.)

ARDEIDÆ (Lat. *ardea*, a heron), the typical family of the sub-order *Herodii*, order *Herodiones*, including the true herons and bitterns. In this family the peculiar feathers known as "powder-down," or *pulviplumes*, reach their highest development, the presence

Great Blue Heron, *Ardea herodias*.

of two or three pairs of such patches being probably diagnostic of *Ardeidæ* (four pairs in the related *Cancromidæ;* not more than one in other birds, when any). In the genus *Ardea* and its immediate allies there are three pairs, the normal number; in the bittern, *Botaurinæ*, the pairs are two. There are other pterylographic characters of *Ardeidæ:* the pterylæ are extremely narrow; there are lateral and often posterior cervical apteria; the lores are definitely naked; there is frequently a development of elegant dorsal plumes and crests, which ornament the species during the breeding-season, and are speedily deciduous. The general form is slender and elongate, with compressed body, very long legs and neck, ample wings, and short tail, the latter of twelve rectrices (ten in the *Botaurinæ*). Notwithstanding that herons are eminently grallatorial, the feet are insessorial—that is, fitted for perching by the length and low insertion of the hind toe. The middle claw is perfectly pectinated, or comb-like, in all the true herons. The bill is longer than the head, more or less slender and acute, with sharp cutting edges; the upper mandible has a long groove; the nostrils are narrow and pervious. There are about seventy-five species of *Ardeidæ*, generally distributed over the globe, but most abundant in warm countries. See HERON. (E. C.)

ARE THORGILSSON (1067–1148), generally called ARE FRODE (*i. e.*, "the wise"), the founder of the Icelandic saga literature, and thus the Herodotus of Scandinavian history-writing, was born in 1067 of a noble family sprung from Queen Aud and King Olaf the White, from whom he was eighth in descent. His father, Thorgils, was drowned in the child's infancy, and so he was fostered at Helgafell at the house of his grandfather, Gelle, who died at Roskild on his journey back from a pilgrimage to Rome in 1073. Then, according to the *Heimskringla*, the boy came, at the age of seven, to Hall Thorarinsson, in Hawkdale, and remained there fourteen years, when Hall died, ninety-four years old. Hall was a man of good parts and a clear memory, and could remember Priest Thangbrand baptizing him when he was but three winters old. The *Heimskringla* also describes Hall as a distinguished man who had been much abroad, and had even been for some time a partner in trade with King Olaf the Saint. Teit, the son of Bishop Isleif, was with Hall at Hawkdale in fosterage, and dwelt there afterwards. He was Are's teacher, and told him much of the history that Are afterwards committed to writing. Thurid, the daughter of Snorre the Chief, is also mentioned as a person from whom Are got much information. At the age of twelve Are was present at the burial of Bishop Isleif, 1079. Of his later life but few particulars are known, excepting the names of his wife, son, and daughter. Doubtless he was a frequent representative at the Althing, where much of his knowledge may have been gathered. He died in 1148, in his eighty-second year. Snorre Sturleson expressly states that Are was the first man in Iceland who wrote in the Norse tongue histories relating to times ancient and modern; and three works by Are are distinctly mentioned: (1) *Konunga-bók*, or "Book of Kings;" (2) *Landnama-bók*, or "Book of Settlements;" and (3) *Islendinga-bók*, or "Book of the Icelanders." He is the first one to use the word *bók* (book); before him all was *vivâ voce* saga ("saying"). The Book of Kings and the Book of the Icelanders are not extant, but are reproduced in abridged form in other works. There is no doubt that the Yuglinga Saga in *Heimskringla* is an abridgment of the *Konunga-bók*, and while the *Islendinga-bók* is lost, we have a partial revision of it, called *Libellus*, by Are himself. The Book of Settlements (*Landnama-bók*) is unique in the whole field of literature. It is the Domesday and Golden Book of Iceland, and well deserves to be ranked with the greatest historical monuments of our race. It opens with a brief account of the settlement of Iceland; then gives a notice of each settler (some four hundred in all), his pedigree and descendants, and of the ground he took, in geographical order, beginning with the southern fjords, and then going completely around the island from west to east. Besides, there is a mass of interesting details—accounts of famous men and women, descriptions of old customs, laws, rites; there are verses and sayings, and references to events in England, Ireland, Scotland, and the Scandinavian continent. It contains about two thousand names of homesteads, nesses, hillocks, brooks, rivers, dales, firths, creeks, mountains, and islands, besides some four thousand names of real persons, of whom about one-third are women. It is hardly too much to say that we are mainly indebted to Are Frode for all the certain knowledge we have of ancient Scandinavia, its life, religion, and institutions; and he fortunately lived, like Herodotus, just in time to gather up and put in writing the traditions that were rapidly being crowded out of men's minds by new interests. Gudbrand Vigfusson, on whose valuable prolegomena to his edition of the Sturlinga Saga (Oxford, Clarendon Press, 1878) this article is mainly based, closes his sketch of Are by calling him "the true father of Icelandic letters, as well as the first prose-writer and the first historian," and adds that "Are's influence and example kindled the flame which burns with no uncertain light in many a noble story, and shines fairest and brightest in the works of his true spiritual sons, the Sturlungs." As he employed his native tongue in his books, he also became the founder of the classic style in which the masterpieces of the Icelandic historians are written; and this fact places his *Landnama-bók* by the side of Ulphilas's Bible and the Saxon Chronicle as a linguistic as well as an historical monument.

ARENTZEN, CHRISTIAN AUGUST EMIL, a Danish poet, born Nov. 10, 1823; travelled in Iceland in 1852, and has since made many journeys to foreign lands. As a poet he belongs distinctly to Œhlenschlæger's school. He has published two volumes of poems (1862, 1867), and two dramas, *Gunlög Ormetunge* (1852) and *Knud den Hellige* (1853). His chief work is, however, *Baggesen og Œhlenschlæger* (8 vols., 1870–78), in which the Danish literature of this century is for the first time properly presented. For Œhlenschlæger's centennial festival in 1879 he wrote *Œhlenschlæger. Literaturhistorisk Livsbillede*, for which he was decorated with the order of Dannebrog. His *Nordisk Mythologi* has passed through three editions.

ARESCHOUG, JOHAN ERHARD, a Swedish botanist, was born in Gothenborg in 1811. He made many botanical journeys through Sweden and Norway, especially for the purpose of studying the vegetation of the sea, and became professor in Upsala in 1858. His most important works are—*Symbola Algarum Scand.* (1838); *Phyceæ marinæ* (1850); and *Corallineæ*, in Agardh's *Species, Genera, et Ordines Algarum* (1863).

See Vol. II. p. 429 Am. ed. (p. 487 Edin. ed.).

ARGENTINE REPUBLIC. Dr. Nicolas Avellaneda, elected president of the republic in 1874, and installed in office Oct. 12 of that year, continued his presidency till Oct. 12, 1880, when Gen. Julio A. Roca was inaugurated as his successor. Gen. Roca is still in office (1882), his constitutional term ending in 1886. The capital is now Buenos Aires, and the province of that name, which was temporarily independent and a separate government, resumed its place in the confederation since 1861.

The fourteen provinces which constitute the republic have not changed their names, but the area of some of them is now nominally diminished, as considerable tracts have been allotted to the four national territories lately organized—*i. e.* Misiones, Gran Chaco, Pampas, and Patagonia. The second decennial census not yet being published, we can only give a very reliable estimate of the actual population in the fourteen provinces and territories as 3,000,000 inhabitants.

The boundary question with Chili has been settled by treaty. It has been agreed that Patagonia is Argentine; the Strait of Magellan is neutralized and belongs to Chili. The limits of the Argentina are now—north

Bolivia and Paraguay; east, the Brazilian provinces of Paraná and Rio Grande, Estado Oriental del Uruguay, and the Atlantic; south, the ocean; west, the crest of the Andes. The estimates of this area are necessarily untrustworthy, since no survey has been made; it has been estimated at nearly 4,000,000 square kilometres. The empire of Brazil is estimated at 8,300,000 square kilometres, and Chili at 321,400 square kilometres.

The population is increasing largely by immigration, the number of immigrants in the ten years from 1871 to 1881 having been 464,914. These are from Italy, France, Spain, Ireland, and Germany. More than half the total population of 3,000,000 are Europeans or of pure European descent; the remainder are mixed white and Indian Guarani and Quichua. Descendants from negro blood are very scarce, this section of South America having been, of all the Spanish settlements, that which had fewest slaves.

The administration of Sr. Avellaneda and of Gen. Roca thus far (1882) have been peaceful and devoted to the improvement of the republic in its public works, agriculture, education, and national culture. The devastating forays of the Indians on the frontier have been brought to an end. The railways and telegraphs have been largely increased; in 1881 there were 1620 miles of railway open for traffic, and 1560 are sanctioned and in rapid progress. The lines open for traffic have cost $54,373,165. The average cost of construction is estimated at $25.000 per mile. In 1881 there were 7571 miles of telegraph-lines, and 15,312 miles of wire in operation; this amount has been increased in 1882. The number and efficiency of the schools has been much increased. There are two universities—one in the capital, another in Córdoba; one national college in each of the provincial capitals for secondary and superior education. The number of private schools in Buenos Aires is very large, and there are normal schools and public national and provincial schools in all the towns of the fourteen provinces. In 1874 the ratio between the population and the children receiving education in schools was 1 in 16 inhabitants. In the same period the ratio in Chili was 1 in 24, and in Brazil 1 in 75.

The commerce of the republic has increased greatly within the past seven years. This has been due to several causes—the extension of the railway system, bringing the products of the interior to market more readily and in larger quantities; the opening of the fine port of Bahia Blanca, on the South Atlantic, in Oct., 1881; the new tariff of 1880, which, though levying export as well as import duties, was not quite so burdensome as the previous one; and the general development of the republic in a time of peace. The following table shows the exports and imports from 1875 to 1881:

Years.	Exports.	Imports.	Total commerce.
1875	$50,331,400	$55,765,627	$106,097,027
1876	46,535,705	34,910,000	81,445,705
1877	43,393,609	39,809,141	83,202,750
1878	36,313,267	42,347,460	78,660,727
1879	47,725,000	44,463,100	88,188,100
1880	56,500,000	44,352,880	100,852,880
1881	54,174,204	56,896,194	111,070,308

Four articles—washed sheepskins, washed wool, baled hay, and alfalfa-seed—are exported duty free. All other articles exported pay an export duty of 6 per cent. on the official valuation. Of the imports, the usual duty is 25 per cent. on the official valuation, but tobacco in all forms, spirituous liquors, fine furniture, boots and shoes, saddles, harnesses, powder, ammunition and most firearms, ready-made clothing, fancy soaps, and umbrellas, pay 40 per cent., and the higher-priced firearms 50 per cent., on their appraisal at the point of shipment. A few articles of prime necessity and home production, as wheat, breadstuffs, meal, etc., are protected and come in under specific duties. Coal, sewing-silk, ploughs, fencing and telegraph wire, books and printing materials, thrashing and mowing machines, and articles especially intended for the use of business-men, are rated at 5 per cent. Duty free are engines for steamers, machinery for factories, rails, locomotives, and all sorts of materials for railways and tramways, iron pipes for gas or sewers, mining implements, and tobacco for sheep-washing.

The exports from the Argentine Republic are wholly of their own products, and the greater part of them in the raw or unmanufactured state. The most important are—wool, which is the first article of production, the skins and hides of domestic animals, of the ox, cow, horse, etc., etc., either salted or dry, and of wild animals, as guanaco, and of birds, which are very numerous in the republic. Among the bird-skins are included those of the ostrich and the swan. Next in quantity come tallow, melted or pressed; dried or salted beef; beef-tongues, salted or pickled; animal oils, horns, horn-piths and points, hair, bone-ash, ostrich and other feathers, baled hay, flaxseed, maize, wheat, and alfalfa-seed. Other products for home use are all sorts of vegetables and fruits, leather, clothes, shoes, blankets, harnesses, carriages, timber and iron fittings for building, charcoal, lime, wine, etc., etc.

The number of cattle in the republic in 1878 was—of neat cattle, 13,493,000; of sheep, 137,546,413. The wheat-crop, only in the new colonies of Santa Fé, on the banks of the Rio Salado, was of $3,805,500 value in the year 1881.

The imports are of all articles for making clothing, French wines, oil, agricultural and all other machinery, sewing-machines, kerosene, brandy, refined sugar, cigars, coal, timber, etc. The imports from the United States are rapidly increasing; and this commerce would be a great deal more important if the import duties upon the wools and other products of the river Plate were not so high as they now are in the United States. The river Plate countries (Argentine and Oriental del Uruguay republics) stand in the third place in the commerce of the United States with the ancient Spanish colonies, and are shown by the following data, which we gather from the quarterly report of the chief of the United States bureau of statistics, June 30, 1882:

General Commerce of the United States with—

1. Cuba	$82,585,476
2. Mexico	23,944,481
3. Rio de la Plata (Argentina and Oriental)	16,592,391
4. Colombia	11,369,816
5. Venezuela	7,921,485
6. Chili	3,585,132
7. Peru	3,574,495

We put together the commerce of the two states of La Plata, because it is impossible to have separate statistics of their imports and exports. The relative importance of this commerce may be estimated by the customs duties, which in 1879 were as follows:

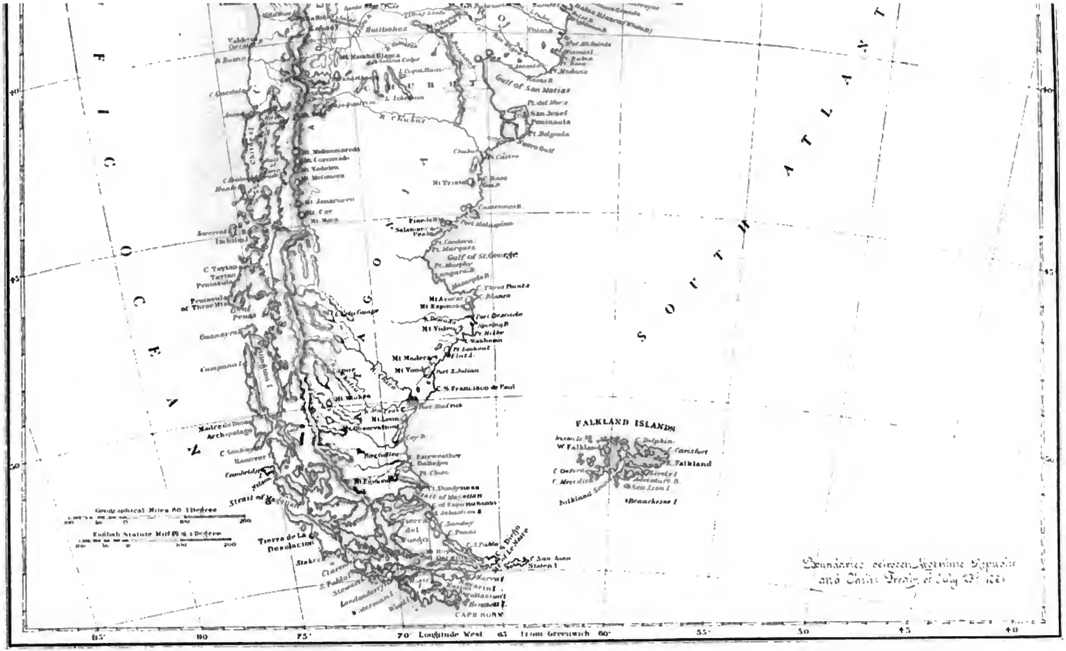
Republica Argentina	$16,064,236
Republica Oriental del Uruguay	4,911,422

The financial condition of the Argentine Republic is not quite satisfactory, but is undoubtedly improving. The revenue collected in the last ten years was—

1871	$12,682,155
1872	18,172,379
1873	20,217,231
1874	16,526,887
1875	17,206,746
1876	13,583,633
1877	14,824,096
1878	18,451,897
1879	20,961,893
1880	19,594,305
1881	21,345,925

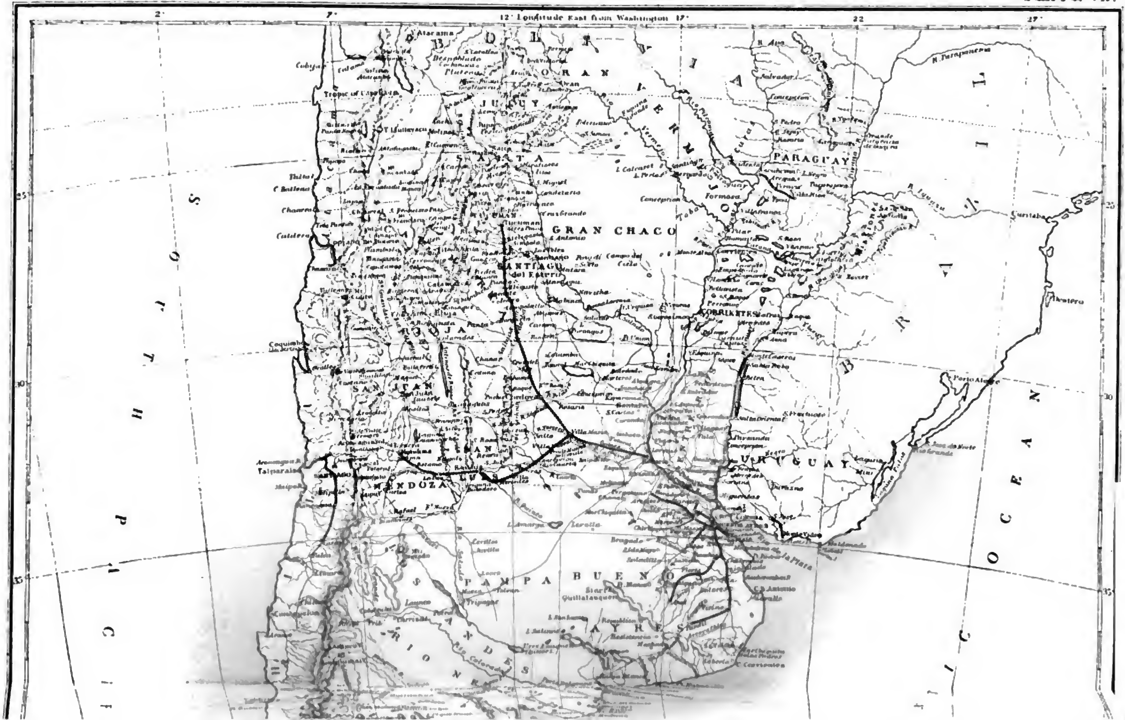
The expenditure always exceeded the revenue, in consequence of the civil wars in the years 1871, 1874, and 1880, which cost the nation a considerable sum, represented by an item of more than $24,000,000 in the internal debt of the republic.

The amount of the public debt on Jan. 1, 1881, was officially stated as in the following table, the debts of the separate provinces not being included:



Boundaries between Argentine Republic
and Chili: Treaty of July 23rd 1881

ARGENTINE REPUBLIC



Foreign debt	$55,953,104
Funded debt (internal)	23,448,037
Floating debt (treasury bills, balance due in the banks, etc.)	24,220,320
Total debt	$103,621,461

A debt of $103,621,461 for a population of not more than 3,000,000 may seem excessive, when the revenues seldom reach $21,000,000 annually; but it is an encouraging feature that for the last two or three years the revenues have exceeded the expenditure; and Indian and civil wars being at an end, the expenditure must diminish and the revenue must grow.

The army of the republic, exclusive of the national guard, consisted in Dec., 1881, of 7662 men—3647 infantry, 3060 cavalry, and 946 artillery. It was commanded by 8 generals, 70 colonels, 71 majors, and 530 other officers. Half-paid and other officers are—10 generals, 110 colonels, 70 majors, and 215 officers.

The navy of the republic at the same time consisted of 16 war-vessels—*i. e.* 3 iron-clads, 6 gunboats, and 7 for torpedoes, besides 17 vessels (two of them sailing) for transports, *avisos*, etc. There are 1 admiral, 2 commodores, 332 officers, and 1738 sailors and marines.

The Roman Catholic faith is the established religion of the provinces, but by the constitution and by custom there are free exercise and toleration of all other creeds, each sect having churches where they worship in the English, German, or French language. The language of the republic at large is Spanish; in the province of Corrientes the common people speak the Guarani, and in Santiago the Quichua. The Indians wandering in the Chaco and in the far south are very few, and the warrior tribes, having been repelled to the west of the Cordilleras, are no longer a serious peril to the farmers settled in the Pampas. The *Gauchos*, or vagrant people, under pressure of the permanent and moral laborers who are taking hold of the country, are improving and disappearing; the Argentine peasant, so often misjudged by superficial travelling observers, is a sober, strong, hard-working man, who only wants to be fairly used.

Cities.—Buenos Aires is a fine city, with 300,000 inhabitants, about one-third of them being foreigners. The climate is healthy; a good system of sewers is in course of completion, and the yellow fever, imported from Brazil in 1871, has not reappeared.

Rosario, 150 miles up the river Paraná, is the second commercial city in the republic. Here is the starting-point of the Central Railway, which connects the port with the northern provinces of Santa Fé, Córdoba, Santiago, and Tucuman, and with the Andean provinces of San Luis, Mendoza, and in a short time with San Juan. Ocean steamers and vessels of eighteen feet draught can easily reach the port of Rosario in all seasons.

Santa Fé has in its neighborhood numerous farms devoted to agricultural pursuits. Sugar-cane is extensively cultivated in Santiago, Tucuman, and Salta. The vineyards of Mendoza and San Juan, and the copper-mines of La Rioja, are only wanting in capital and intelligent labor. No South American state is now, in fact, a more thriving country than the Argentine Republic. (L. L. D.)

ARGYLL, or ARGYLE, George John Douglas Campbell, eighth duke of Argyll; born at Ardencaple Castle, in Dumbartonshire, in 1823. In 1842, when he was only nineteen, he published a *Letter to the Peers, from a Peer's Son*, in which, in the interests of Scottish Presbyterianism, he considers the conflict of opinions in the Church of Scotland. He succeeded his father in 1847, and the next year published a treatise entitled *Presbytery Examined*, in which he opposes all forms of hierarchy. He became at once an active and eloquent member of the House of Lords. In 1853 he was made lord privy seal, and under the administration of Lord Palmerston was in charge of the postal affairs from 1855 to 1858. He was hereditary sheriff of Argyleshire, and was appointed lord lieutenant in 1862. In 1851 he was elected chancellor of the University of St. Andrews; in 1853, a member of the Privy Council of England; and in 1854 lord rector of the University of Glasgow. The degree of LL.D. was conferred upon him by the University of Cambridge in 1862. From 1868 to 1874 he was secretary of state for India. His vindication of the *Patronage Act* (as it concerned the Scottish Church) appeared in the latter year. In 1878 he travelled in the United States. In 1879 he published *The Eastern Question from the Treaty of Paris to the Treaty of Berlin and to the Second Afghan War*, in two volumes, defending the policy towards Afghanistan pursued by the Liberals when in office and advocated by them in opposition. In 1880, on the return of Mr. Gladstone to power, the duke again took office as lord privy seal; but having disagreed with his associates as to the concessions to Irish feeling to be made in the Land Act of 1881, he retired in April of that year, and has shown himself a severe critic of his former associates.

Throughout his career the duke has found time to study art and literature, of which he is an ardent supporter, and has frequently lectured upon such topics. The work by which he is most favorably known is a small treatise on *The Reign of Law*, which is philosophical, thoughtful, and devout; this appeared in 1866, and passed through several editions in England and America. In 1869 he issued a kindred treatise, entitled *Primeval Man;* in 1870 he wrote the results of a visit to one of his proprietary estates in *The History and Antiquities of Iona*, which contains a remarkable, though unintended, vindication of Henry C. Carey's theory of the occupation of land.

The duke married in 1844 the Lady Elizabeth Georgianna Gower, eldest daughter of the Duke of Sutherland, by whom he has had nine children. The eldest son, George Edward Henry Douglas Sutherland, marquis of Lorne, married the princess Louise, daughter of Queen Victoria, and is now (1882) the viceroy of Canada. True to his liberal principles, the duke placed another son in trade, as a tea-merchant in London. (H. C.)

ARICKAREES, also contracted into Rickarees and Rees, a tribe of American Indians of the Pawnee family who originally dwelt in the valley of the Platte River, in company with the closely-related Pawnees, from whom they separated about a century ago. Thence they made their way northward to their present location on the upper Missouri. They were originally numerous, composing ten large tribes, but have become greatly reduced by warlike incursions of the Sioux and by the ravages of the small-pox, by which they were decimated in 1791 and again in 1837.

The Arickarees were an enterprising and warlike race, who early came into hostile collision with the whites. In 1823 they made a fierce assault on a company of traders led by Gen. Ashley, of whom 23 were killed and wounded. In return, they were attacked by Col. Leavenworth, who assailed them in two palisaded villages on Cannon Ball River. After a severe fight they were defeated by the troops and forced to conclude peace. But they fled during the succeeding night, and their towns were burned by the traders. The Sioux took advantage of this defeat, seized the country of the Arickarees, and forced them to become nomads. By 1825 they had returned from the Platte, to which they had fled, and were again on the Missouri. A treaty was made with them in this year, but it had little effect upon the savages, whose hostile depredations continued. In consequence, all trade with them was closed in 1831, and they became wanderers again, returning to their old hunting-grounds on the Platte. A few years later they were again on the Missouri, where, together with the Mandans and the Minnetarees, they were severely scourged by the small-pox. The remnants of the three tribes joined together, and have since continued in union. The tribes they joined being active agriculturists, the Arickarees have assumed the same habits, and have lost their warlike proclivities. In 1838 they were spoken of by the Indian agent as notorious for treachery and barbarity, and as having murdered and pillaged more of our citizens than all the other tribes between the Missouri and the head-waters of the Columbia. To-day they are fast friends and allies of the whites. Gen. Sheridan said of them in 1871: "They have always been civil and well-disposed, and have been repaid by the Government with neglect and starvation."

In 1862 the Arickarees were removed to a reservation at Fort Berthold. During the Civil War some of them served as scouts in the Northern army. By the treaty of 1866 there was appropriated $75,000 per annum for the sustenance of the three tribes. In 1870 a reservation was assigned them in North-west Dakota and Eastern Montana embracing 13,500 square miles. They now live in well-built log houses, having acquired the art of building, not from the whites, but from the partly-civilized Mandans. Their number is reduced to about 1000 souls. (C. M.)

See Vol. II. p. 472 Am. ed. (p. 538 Edin. ed.).

ARIZONA, a Territory of the United States, is situated between 31° and 37° N. lat., and between 109° and 114° 40′ W. long. It is bounded on the north by Utah and Nevada, on the east by New Mexico, on the south by the Mexican state of Sonora, and on the west by California and Nevada. It is divided into ten counties: Yuma, Pima, Cochise, Pinal, Graham, Gila, Maricopa, Apache, Yavapai, and Mohave. According to the latest surveys, it contains 113,916 square miles, or 72,906,240 acres. Its population in 1870 was 9658; in 1880 it had increased to 40,440, and it is now (1883) estimated at 50,000. The assessed valuation of real estate in 1880 was $3,922,961, and of personal property was $5,347,253, making a total of $9,270,214.

Topography and Geology.—Nearly the whole Territory consists of a series of elevated plains, on which the mountain-ranges, isolated peaks, and volcanic cones have been built up. The country rises gradually from the south-western corner to the boundary-line of New Mexico, and in the north-east, still retaining the form of a great plain, it reaches a mean altitude of 5000 feet. The general trend of the mountains is north-west and south-east, but in the eastern part of the Territory the Mogollon range and the Sierra Blanca extend east and west, and in the western part the Cerbat range extends north and south.

The south-western plateau is a desert traversed by numerous mountain-chains, nearly all conforming in trend with the longitudinal axis of upheaval common to the country. These mountains rise abruptly from the surface of the plateau, and the spaces between them are not valleys, but broad plains, with a steady ascent towards the east. While thus embossed with mountain-peaks and ranges, this plateau is deeply furrowed with gulches and ravines eroded by the "cloud-bursts," which sometimes precipitate in a few minutes an incredible quantity of water. The mountains, though not very high, are steep and craggy volcanic cones or bald masses of glistening granite. Not only are the mountains destitute of water or verdure, but the intervening plains are almost equally dry and barren, the soil, a coarse gravel or drifting sand, producing only a small amount of the native grasses, some trees of the *palo verde*, with greasewood and cacti, the accepted emblems of aridity and desolation. Nothing can be more dreary than the aspect of this entire region. Hot, dry, and nearly treeless, producing nothing fit for human subsistence, with no animal life save the hare, coyote, rattlesnake, and a few reptiles, it is a land to be avoided by civilized man, and even by the wild Indian. The very air on these torrid plains is lifeless, being little stirred by tempests; only the sandstorm prevails. Here the optical illusion known as the mirage takes on the most weird and fantastic shapes: so seemingly real are the appearances it presents that cattle, allured by them, have escaped from their keepers and rushed frantically to death. Of all that is wondrous in this Western Edom, nothing so works on the imagination or bewilders the judgment as these airy images, which, assuming ever-varying forms, fade at last into burning air as the eager pursuer approaches the site of their supposed existence. The atmosphere, generally so torpid, is occasionally ruffled by a whirlwind, which, lifting the dust and sand on high, forms them into tall spiral columns, that, revolving as they advance, stalk like majestic spectres over the desert. These, though the most notable, are not all of the meteorological marvels of the inhospitable wastes of South-western Arizona. From north to south across this section stretches a lava-flow about a mile in width, on which stand two parallel lines of symmetrical volcanic cones varying from 100 to 300 feet in height. In the vicinity of the Gila there are also lava-beds of irregular shape.

The south-eastern part of the Territory is much more mountainous than the south-western and western, the mountains here being also higher and containing more wood, grass, and water. The surface-configuration described prevails, with slight modifications, from the southern boundary as far as 34° N. lat., above which the plateau system is found in greater perfection and with less disturbance than at the south. As it approaches the Colorado this far-reaching plateau breaks into three benches, varying in height from 4000 to 6000 feet above the sea. At intervals on this elevated plain are the table-lands, the *mesas* of the Spaniards. These singular and picturesque geological remains consist of elevated sections of country, flat on top, and bounded by mural faces always steep and generally vertical. They sometimes rise 1000 feet or more above the general level of the plain on which they stand. They are composed of sandstone and other rocks of the Cretaceous series, and these, having been shattered by earthquakes or other convulsions of nature, have since been weathered into extraordinary shapes. Over an area of 20,000 square miles are to be seen towers, spires, and columns rising amid the ruins of cyclopean cities; castles, buttes, fortifications, and turreted walls more than 1000 feet high overlook the plains or stand on the verge of narrow and deep chasms. Great mountains, darkly timbered, lift their heads into the region of eternal snow, while green meadows and verdant slopes contrast with the lava-fields and basaltic flows that cover part of the plateau.

Rivers.—Diagonally across the north-western angle of this marvellous land the Colorado River makes its way through a cañon nowhere more than a mile wide, but everywhere more than a mile deep, and the gorge of the Colorado Chiquito from the south-east is in some places nearly as deep. The Grand Cañon is the most stupendous fissure in nature, extending for 300 miles. Its walls are sections of nearly horizontal strata; it cuts even into the solid granite for 500 or 1000 feet. So deep and narrow is the gorge that at midday in clear weather a person looking upward from the river can see the stars in the sky. When an explorer has once entered these awful chasms there is no escape until he passes clear through them to places where the banks are less precipitous. The natural effect of the scenery of this part of Arizona is heightened by the rarefaction and purity of the atmosphere, which impart a wonderful distinctness to remote objects and deceive the most practised eye in measuring distances. The entire Territory is drained by the Colorado and its tributaries, of which the considerable streams within its limits are the Colorado Chiquito, Bill Williams' Fork, and the Gila, all entering the main river from the south-east and east. The Colorado Chiquito has two branches, the Rio Puerco and the Zuñi; Bill Williams' Fork has one, the Santa Maria; and the Gila has five, the Rio Salinas or Salt River, the Rio Verde, the San Carlos, the San Pedro, and the Francisco. The Santa Cruz, a long, shallow stream, enters Arizona from Sonora, and after a north-westerly course of 180 miles disappears in the gravel and quicksand before reaching the Gila. The Hassayampa and Agua Fria, which approach the Gila from the north, are in like manner absorbed. While the main Colorado, whose sources are in the Rocky Mountains, has always a large volume of water, the other rivers are during most of the year small streams, and some in the dry season are swallowed up in the sand. The Colorado, the only navigable stream, is so obstructed with bars and shallows, so frequently shifts its channel, and has such a strong current even when the water is low, that steamers of light draught can with difficulty make their way up it. Owing to these hindrances to navigation, a railroad has been projected to extend along the banks of this river from Port Isabel, at its mouth on the Gulf of California, to Callville, the head of navigation, 600 miles above. While the upper Colorado and some of its branches flow through cañons, most of the rivers of Arizona meander through valleys and plains, their low banks being lined with sycamore, mesquite, cottonwood, and willow trees. There are but few creeks, though among the mountains in the central and eastern parts there are some streams, which, however, generally sink into the ground after leaving the cañon.

Natural Wells.—There are no lakes in Arizona, the largest body of standing water covering only a few hundred acres. But in many parts there are "wells" or pools of water standing in crevices, pot-holes, and other natural depressions in the rock. The rain-water stored in these receptacles remains good for a long time, and they are often the only source of supply within reach. On a high mesa near the Colorado there are so many of them that the place is called the "Region of the Thousand Wells." Nearly all these wells are circular, with a diameter of from 20 to 100 feet, and of considerable depth. They are sometimes several rods apart, and in other places are separated only by a narrow wall of rock. They seem to be replenished only by the rains, which are not abundant in this region, and yet they are never destitute of water. The most remarkable well is the Montezuma, 55 miles N. W. of Prescott. It occupies a circular pit in a limestone mesa 100 feet across and having vertical walls 70 feet high; the water is 100 feet deep, and always clear. Within the pit are the remains of prehistoric dwellings, showing this spot to have been formerly inhabited by the "Cliff-dwellers," of which people the Moquis and Zuñis, now living 150 miles to the east and north-east, are perhaps remnants. Besides these rock-wells, ordinary springs are occasionally found, but they are not numerous, nor is their water always palatable.

Climate.—Taken as a whole, Arizona is noted for its high temperature and extreme aridity. In the valley of the lower Colorado and throughout the country south of the Gila, except in the mountains, the thermometer in summer ranges all day from 90° to 110° Fahr. in the shade, and in some places and seasons reaches 120°. At Fort Yuma the average summer noon temperature is 100°, and it seldom falls below 90°; the annual average is 73·5°. At Fort Mohave, in the valley of the Colorado, 200 miles north of Fort Yuma, and at Port Isabel, 100 miles south, the temperature is the same, showing this region to be nearly as hot as the Desert of Sahara. Within this thermal belt the weather for four or five months of the year is delightful, the mercury ranging from 60° to 75° Fahr. during the day, and falling about 15° or 20° at night. In other parts of the Territory the summers are not so hot as at Fort Yuma by 15°, but the winters are colder in the same proportion, severe frosts occurring in all localities having a greater altitude than 5000 feet. Snow falls occasionally, but not to a great depth, nor does it lie long. Below 2000 feet either frost or snow is rare. On the mountains the snow reaches a great depth, and some of the more lofty peaks are covered with perpetual snow.

Arizona may be said to have two wet seasons—one in summer, the other in winter. In an average locality the annual rainfall is 20 inches, two-fifths of which fall in January and February, two-fifths in July and August, the rest being distributed through the remaining months. Over a considerable portion of the Territory, however, the annual rainfall is less than 5 inches; at Fort Yuma and in a large part of the south-eastern section the average is 3·5 inches. The rain here comes in heavy showers, with much thunder and lightning, and an entire rainy day is unknown.

In the mining districts, though the days are hot, the nights, even in summer, are generally cool, and the heat, at a temperature of 110°, is less oppressive than at 90° on the Atlantic coast. Arizona has no endemic diseases, and appears to be well adapted for the residence of persons suffering from pulmonary diseases. Such are the purity and dryness of the atmosphere that the flesh of animals can be cured without salt simply by exposure to the air.

Agriculture.—The amount of land in Arizona available for successful agriculture is small. Along the larger rivers there is a considerable extent of rich bottom-lands, and there are many fertile valleys in the central, eastern, and south-eastern portions of the Territory. Water rather than land here determines the agricultural capabilities of the country. There are about 3,000,000 acres to which, with moderate outlay for constructing ditches, enough water could be brought to ensure good crops, and probably 10,000,000 acres that could be sufficiently irrigated with artesian wells. By these means not only cereals and the hardier fruits of the north, but also cotton, ramie, sugar-cane, and the semi-tropical fruits, might be raised. Already large portions of the Colorado bottoms have been reclaimed by levees, and the lands prepared for cultivating cotton and sugar-cane. Of the cereals from 40 to 50 bushels per acre can be raised, and two crops, one of grain and the other of vegetables, can be taken from the same field. Four or five crops of alfalfa and three of the other cultivated grasses can be taken from the same land yearly. Fruits and vegetables do not thrive so well, on account of the attacks of multitudes of insects. Early frosts in autumn and late frosts in spring, as well as unseasonable hot weather near the end of winter, often injure both fruits and vegetables.

Arizona may be subdivided as follows: Farming lands capable of being irrigated, 20,000,000 acres; timber lands, much covered with trees of small growth, 10,000,000; grazing lands, 35,000,000; deserts, some portions producing a little bunch-grass, 35,000,000. Some of the grazing lands, to make them practically available, would need wells to be sunk to afford water to the stock. Central, Eastern, and North-eastern Arizona contain a larger proportion of arable land than the rest of the Territory. The following valleys contain much good land, and, being generally well supplied with wood and water, are capable of sustaining a large population: Val de Chino, north of Prescott, Walnut Grove, Colorado Chiquito, Williamson's, People's, Kirkland's, Skull, Thompson's, and Agua Fria. Some of these valleys contain fully 500,000 acres of good land, with facilities for irrigation. In the north-eastern part of the Territory, not yet much explored, the Moquis and the Navajoes, partially civilized Indians, live mainly by cultivating the soil. Among the Mogollon, Pinal, and Sierra Blanca mountains there are known to be many small valleys suitable for settlement. Farther south the agricultural lands are chiefly in the river-valleys, and from these Arizona has for some years produced all the grain and vegetables needed for home consumption. According to the census of 1880, there were in Arizona 767 farms; 1818 acres were devoted to Indian corn, producing 34,746 bushels; 9026 acres to wheat, producing 136,427 bushels; 12,404 acres to barley, producing 239,051 bushels; and 29 acres to oats, producing 564 bushels.

Grazing.—While some grass may be found even in the desert, the best grazing districts are in the central, eastern, and northern parts of the Territory, and there some very extensive sheep- and cattle-ranges exist. On the foothills, though there is generally an abundance of grass, there is often a scarcity of water, and therefore the mountains afford the best summer-ranges for stock. All the grasses here are perennial, propagating themselves from the root. The grass most depended upon is the grama, which, though short, is very nutritious, and grows in bunches widely separated instead of covering the ground. Intermingled with the grama is the mesquite, also good for stock, and sometimes the saccatone, less succulent and nutritious. These are found chiefly between the altitudes of 3000 and 6000 feet, other kinds being found on the higher mountains.

Botany.—The principal trees are the mesquite, ironwood, palo verde, and palm, found chiefly in the deserts and on the barren hills, with cottonwood, sycamore, and willow along the rivers, and pine, spruce, fir, oak, walnut, and wild cherry in the mountains. On the arid, sandy plains occur the cactus, greasewood, wild sage (*Artemisia*), and other worthless shrubs. Flowers of bright hues, but lacking in fragrance, abound everywhere except in the mountains and deserts. There are many indigenous plants and herbs, for some of which medicinal properties are claimed.

Zoology.—The principal mammalia are the panther, cougar or Rocky Mountain lion, several species of deer, antelopes, mountain-sheep with enormous horns, grizzly and cinnamon bears, the lynx or wild cat, puma, jaguar, fox, and wolf. There are also many smaller animals of the hare, rat, and squirrel tribes. Good fish are found only in the mountain-streams. Birds and reptiles of different kinds are numerous; among the latter the rattlesnake is the most dangerous. The partridge and wild turkey are plentiful in the mountainous districts of Eastern Arizona, and are esteemed for the delicacy of their flesh. In some sections the snow-goose, cranes, herons, ducks, and other waterfowl abound.

Metals and Minerals.—Arizona is rich in both of the precious and many of the useful metals, and possesses also a great variety of minerals. Gold here occurs in placers, in auriferous quartz, and combined with other metals. There are well-authenticated accounts of silver having also been gathered from placers that were formerly worked here. In no other of the Pacific States or Territories do the deposits of the precious metals appear to have been so generally distributed; gold and silver lodes have been found in every district of Arizona, so far as explored. While many of the mining enterprises here have resulted in failure or have been attended with disappointment, many have turned out moderately well, and some have proved eminently successful. Few mines in any country can show a better record than the Silver King in Pioneer district, or the Tombstone, Contention, Grand Central, and Ingersoll in Tombstone district. Considering how short a time has elapsed since the miners have been secure from Indian attacks, the result of mining in Arizona compares favorably with that in Utah or Nevada.

The placers of Arizona are not so rich as those in the States and Territories farther north. They are scattered over a wide area, and have resulted from the decomposition of auriferous quartz-lodes in the neighborhood, and can generally be traced to their origin. They are usually shallow, from one or two to six or eight feet deep, and in many instances are widely spread, thus making the ground comparatively poor. Most of these placers are "dry diggings," so called because, on account of the scarcity of water, the gold is separated from the earth by a sort of winnowing process instead of washing. The Mexican miners are expert at this work, and some attempts have been made to perform it by machinery, but without much success. The first placer in Arizona was discovered in 1861 at La Paz, in Yuma county, a few miles east of the Colorado River. Although it was soon worked out, the discovery gave a decided impulse to immigration, and led to the finding of other placers in the south-western part of Yavapai county, which have been worked ever since, having the advantage of easy access to water. Dry diggings occur in the foothills of the Castle Dome range, on the north side of the Gila, 16 miles east of Fort Yuma; also in the Santa Rita Mountains and in the Papago country, south-west of Tucson. There are about 2000 placer-miners, including Indians and Mexicans, who make each from $2 to $6 per day. The deposits being shallow, no drift-mining can be carried on, and but few claims are worked by the hydraulic process.

Nearly every mountain-range in Arizona contains veins of gold, silver, lead, or copper ores, and the mines are numerous. Coal and iron, apparently of good quality, are also found in various parts of the country. Rock-salt is plentiful; near Verde there is a large bed of this mineral, yielding 80 per cent. of pure salt. Within two miles of Prescott there is a large deposit of gypsum, and it is also found elsewhere. Kaolin, fire-clay, and all the common minerals are abundant. Silver occurs as a sulphide combined with iron, lead, antimony, etc.; also as a chloride (horn silver), and sometimes is found native. Most of these ores are reduced by the mill-process; that is, by crushing and amalgamation, some requiring to be roasted. Those with a large percentage of lead are reduced by smelting. Copper is found as a red oxide, blue and green carbonates, and in some places is quite abundant in metallic form. The most extensive deposits yet opened are in the Clifton district, near the intersection of the 32d parallel of N. lat. and the 109th meridian. Here extensive smelting-works have been erected, and the production of the metal is quite profitable. Previously, some of the ore was carried in wagons 800 miles, and then 1400 miles by railroad.

The total value of the gold and silver produced in Arizona to the end of 1881 was about $20,000,000; the yield for 1882 is estimated at $7,000,000. The total value of all the mineral products of the country to the end of 1882 probably exceeded $30,000,000. The two great hindrances to mining and prospecting operations have been the hostility of the Indians and the great cost of transportation, but both of these have been much diminished by the construction of the Southern Pacific Railroad across the Territory, and by the almost complete subjugation of the Apaches and other dangerous tribes. These Indians have now either been exterminated or have been gathered on reservations, where they are fed, clothed, and taught to cultivate the land.

Manufactures.—In 1880 there were 66 manufacturing establishments, with a capital of $272,600. The materials used were valued at $380,023, and the products at $618,365.

History.—The first exploration of this region was made by Vasquez Coronado, who was sent from Mexico by the viceroy Mendoza in 1540. The Spaniards were allured by stories of a land rich in precious metals and of a people living in splendid towns called "The Seven Cities of Cibola." Coronado, finding a few half-civilized Cliff-dwellers and some Pueblo Indians, who cultivated in a primitive way small patches of ground, retired quickly from the country, which offered so little to tempt cupidity or to gratify a love of glory. About 1580 the Spaniards again entered this region, and established a military post on the site of the present capital, Tucson, and in a few years founded presidios and pueblos farther south in the valley of the Santa Cruz. The Jesuits were especially active in establishing missions and introducing among the natives the elements of Christian civilization. For more than a century these settlements increased by immigration from Mexico and by conversion of the natives, despite the constant warfare kept up by the Apaches and other hostile tribes. There was at one time an unbroken line of settlements from Tucson to the Sonora line, a distance of more than 100 miles; the ranches were stocked with large herds of cattle, the missions had splendid church-buildings, several towns sprang up, and silver-mining was carried on in the neighboring mountains, as many as two hundred lodes being worked. But when the power of Spain declined, the incessant attacks of the implacable savages at last ruined these remote settlements; the rancheros were killed and their cattle driven off; the small garrisons being overpowered, the pueblos were plundered and their inhabitants massacred or carried captive. Even the Christian Indians at times gave trouble, refused obedience to their spiritual guides, and relapsed into idolatry. By the year 1770 the mines were nearly deserted, many missions and pueblos were in ruins, and the white population greatly reduced in numbers. After a season of slow decay the destruction of these settlements was completed by the Mexican revolution of 1821 and a general uprising of the Apaches in 1827. In 1824 some hunters and trappers, who pursued their calling among the Rocky Mountains, roamed as far west as Arizona, and these appear to have been the first persons from the United States to visit the country. The first American settlers were persons who, when on their way to California in 1849, stopped on the Gila to engage in stock-raising. By the Treaty of Guadalupe Hidalgo, ratified Feb. 2, 1848, the United States acquired from Mexico a large extent of country, including California and the adjacent territories. By the Gadsden Purchase, ratified Dec. 30, 1853, the United States acquired another tract south of the former, 460 miles in length from east to west, with a breadth varying from 130 miles to 40. Arizona, after its annexation, formed part of New Mexico until Feb. 24, 1863, when it was organized as a separate Territory, with boundaries nearly as at present. A tract of 12,225 acres, lying west of the Colorado River, was afterwards detached and joined to Nevada. The hostility of the Apaches, the Civil War, and other causes for some years greatly retarded immigration and the development of the country. (H. D.)

ARKANSAS, a State of the United States, has a land-area of 53,045 square miles, with 540 square miles of river surface and 265 of lakes, etc., making 53,850 square miles. It is divided (1880) into 74 counties. The population at the several census periods since 1820, inclusive, is shown by the following table:

See Vol. II. p. 473 Am. ed. (p. 539 Edin. ed.).

	White.	Free colored.	Slaves.	Total.
1820	12,579	77	1,617	14,273
1830	25,671	141	4,576	30,388
1840	77,174	465	19,935	97,574
1850	162,189	608	47,100	209,897
1860	324,191	144	111,115	435,450
1870	362,115	122,169	......	484,471
1880	591,531	210,994[1]	......	802,525

[1] Including 133 Chinese and 195 Indians.

Of the population in 1880, 416,279 were males and 386,246 females. Those born in the United States numbered 792,175; in other countries, 10,350. There were 154,272 families and 149,377 dwellings, an average of 5·20 persons to a family and 5·27 persons to a dwelling. The average number of acres of land to each family was 220·06. There were 2·82 dwellings to each square mile. Of the males, 129,675 native and 6475 foreign-born were twenty-one years old and upward—making a total of 136,150.

The chief interests of Arkansas are agricultural. By the census of 1880 there were 1202 manufacturing establishments, with a capital of $2,953,130, employing 4556 hands (4306 were males over sixteen years of age) and paying annually $925,358 in wages. Their product annually amounted to $6,756,159. The following were the principal crops in 1879, by the census of 1880:

Crop.	Acres.	Yield.	
Barley	157	1,952	bushels.
Buckwheat	92	548	"
Indian corn	1,298,310	24,156,417	"
Oats	166,513	2,219.822	"
Rye	3,290	22,387	"
Wheat	204,131	1,269,730	"
Tobacco	2,064	970,220	pounds.
Cotton	1,042,976	608,256	bales.

These figures show the preponderating importance of cotton, Indian corn, and wheat. As to cotton, Arkansas ranked as the fifth State of the Union, being exceeded only by Mississippi, Georgia, Texas, and Alabama. In product per acre it took the third place, being exceeded only by Missouri and Louisiana. One of its counties, Jefferson, had the third largest product per acre (·58 bale) in the country, being exceeded only by Dunklin co., Mo. (·60 bale), and Texas co., La. (·59 bale). By the census of 1870 the cotton-crop of Arkansas was 247,968 bales, so that the increase of production has been large. It is estimated that there are within the State 6,000,000 acres of land suited to cotton-culture. In a message to the legislature prior to the Civil War the governor claimed that with a sufficient supply of labor to bring under cultivation the whole of the cotton lands, "Arkansas alone could supply annually to the markets of the world as much cotton as has ever been raised in any one year in all the cotton-growing States of the Union." In the northern portions of the State some cane-sugar is made and some rice grown. The forests furnish many varieties of timber, the most valuable being black walnut, and the most useful and abundant pine and oak. Apples and pears grow in the northern and western sections of the State, and peaches, apricots, plums, etc., flourish generally. The grape, the cultivation of which in vineyards has been undertaken within the past few years, is found to yield abundantly. Most of the small fruits are native to the State, and in some localities convenient to railroads are profitably cultivated for sale in distant markets. The same may be said of apples and peaches, which have become a considerable item of shipment, and will increase, no doubt, with the extension of railway facilities. The grasses grow readily and produce well. The statistics of live-stock by the census of 1880 were as follows: Horses, 146,333; mules and asses, 87,082; working oxen, 25,444; milch cows, 249,407; other cattle, 433,392; sheep, 246,757; swine, 1,565,098. There were 94,433 farms in 1880, against the following numbers by the preceding censuses: 1870, 49,424; 1860, 39,004; 1850, 17,758. The large increase, partly attributable to the enlarged settlement of the country and occupancy of its wild lands, also marked, after 1860, and especially between 1870 and 1880, the change of agriculture from large plantations to smaller farms, due to the new system of labor—free workmen instead of slaves. Of the whole number of farms in 1880, there were 65,245 occupied by their owners, 9916 were rented for a fixed sum in money, and 19,272 were rented for shares of the produce.

State Seal of Arkansas.

The climate is temperate, but liable to sudden and considerable variations in temperature. At Little Rock the thermometer has a range, throughout the year, of from 15° to 99° Fahr., and averages 62·66°. The mean temperature for the winter months is 43°, and 79·33° for the summer. There is but little snow in winter, and there is less complaint of the trying north winds than in more westerly regions.

There were, by the census of 1880, of persons ten years old and upward, 153.229 who were unable to read, being 28·8 per cent. of the whole number of that age, and 202,015 who could not write, being 38 per cent. The latter class were thus divided: Native whites, 97,990; whites of foreign birth, 552; colored, 103,473. The existing system of public schools was established in 1868, and has materially advanced in usefulness. The superintendent of instruction reports it as more efficient and more popular than at any time heretofore. For the school year 1879–80 the following statistics are derived from the report of the U. S. Commissioner of Education: youth of school age (six to twenty-one years), 247,547; total enrolled, 70,972; number of public schools, 3100; school-houses built during the year, 190; total number of school-houses in the State, 785; value of school property, $198,608; male teachers, 1432, female teachers, 395—total, 1827; receipts for school purposes $256,190; expenditures for same, $238,056. There is a State superintendent of public instruction, elected by the people for two years, who has executive supervision of the system. By the constitution the State school-tax is not to exceed 2 mills on the dollar in any one year, and by law district taxation is limited to 5 mills on the dollar. A capitation tax of $1 upon each male citizen over twenty-one years old is also laid for school purposes. From 1870 to 1880 the trustees of the George Peabody educational fund had appropriated $70,300 in aid of education in Arkansas. The Arkansas Industrial University, at Fayetteville, organized in 1871, is open to both sexes (white), and has a normal department for the training of teachers; at Pine Bluff, in 1875, a branch normal school was opened for colored students. In each of these there are 237 State scholarships, entitling the holder to four years' free tuition.

The railroad system of Arkansas, now extensive and important, is of recent growth. At the beginning of the Civil War, in 1861, there was no completed line of railroad, the projected Memphis and Little Rock road having been built only as far as Madison, on the river St. Francis, a distance of forty miles. This line has since been finished, but up to Jan. 1, 1870, the completed mileage of the State only amounted to 128 miles. After that date numerous roads were begun under votes of State aid by the legislature, though the bonds created on this account have since been repudiated by the State. The railroads of the State, Dec. 31, 1881 (as stated by *Poor's Manual*), made a total length of 1041·85 miles. The several lines were as follows: Arkansas Midland, Helena to Clarendon, 50 miles; Arkansas and Louisiana, Washington to Hope, 10 miles; Cotton Plant Railroad, Brinkley to Cotton Plant, 11 miles; Hot Springs branch, Malvern to Hot Springs, 25 miles; Iron Mountain and Helena (in progress), 43 miles; Little Rock and Fort Smith, Argenta to Fort Smith, 168 miles; Little Rock, Mississippi River, and Texas, 170 miles; Memphis and Little Rock, 135 miles; St. Louis, Iron Mountain, and Southern, 339 miles within the State; St. Louis and San Francisco, 60 miles within the State; Texas and St. Louis of Arkansas, 23 miles within the State.

The public debt of the State, as it stood on Oct. 1, 1880, was thus stated (*Poor's Railroad Manual*, 1882):

* Funding bonds of 1869, 6 per cent	$810,000
* " " 1870, 6 "	1,076,000
* " " 1870 (Holford), 6 per cent	1,268,000
† Sinking-fund bonds, 1874–75 (Loughborough), 6 per cent	412,000
† 10-year bonds of 1874, 10 per cent	181,500
R. Levee bonds or warrants, 7 per cent	1,986,773
R. Bonds to Memphis and Little Rock R. R., 7 per cent	1,200,000
R. Bonds to other railroads, 7 per cent	4,150,000
* Old unfunded debt, incl. int., 6 per cent	1,985,955
State scrip, 5 and 8 per cent	1,353,121

All the indebtedness marked above with stars (*) was regarded as "acknowledged" at the date mentioned, but interest was not then paid on any except the two classes marked with a dagger (†), amounting to $593,500. All the other had either been distinctly repudiated or was in doubt, and in default of interest. The three classes marked *R.* had been repudiated, the levee bonds having been decided invalid by the State supreme court, and the railroad bonds similarly dealt with by the legislature upon the ground that they were "created by alien adventurers."

The report of the treasurer of Arkansas, covering the two years ending Sept. 30, 1882, adds some particulars to the above showing, though it fails to make the financial condition of the State clear and intelligible. According to this report, the bonded debt was, on the date named, $2,523,700, with interest due of $2,554,992, making a total of $5,078,692. The several classes of bonded indebtedness appeared to be as follows:

Funding 6-per cents. of 1869	$776,500
" " 1870 (excl. of Holford's)	625,000
Sinking fund 6-per cents. of 1874–75 (Loughborough)	412,000
10-per cent. bonds of 1874	6,200
Old debt (including interest)	2,406,983

From this it appears that the three classes of debt considered in 1880 as repudiated had now been dropped from consideration; that the "old debt" had increased by the neglect of interest; that the "Holford" 6-per cents. were now not "recognized," and the other 6-per cents. of 1870 had been reduced nearly one-half in amount, while the bonds of 1869 had undergone slight change, and the "Loughborough" bonds remained the same as in 1880. This indicates, in a fair degree, the manner in which the State's finances had been managed, and the treasurer's report does not give the disbursements made by him during the two years to which it relates, as in his opinion a list of them would not be intelligible. The general fund income of the State for the two years (including a balance on hand, Oct. 1, 1880, of $76,818 in currency and $134,150 in State scrip) appears to have been $937,590 in currency and $226,391 in State scrip, while the expenditures amounted to $842,919 in currency, leaving a balance on hand (currency) of $94,671. The income of the school fund during the two years was $81,031, and expenditures $70,753—these sums being in currency and exclusive of issues of scrip. On account of the sinking fund the treasurer reports an income of $799,786 in currency, and expenditures of $711,055.

The capital of the State, Little Rock, on the Arkansas River, 300 miles above its mouth, is the "La Petite Rochelle" of the old French voyageurs, so called because from the mouth of the Arkansas up to this point the entire course of the river lies through wide "bottoms," the banks of the stream being low and sandy, so that not even a stone is to be seen until this place is reached. Here a tongue of rock juts out from the bluff shore into the river, and, giving novelty to the topography, was taken as a name for the place. It was distinguished from "La Grande Rochelle," a perpendicular cliff, standing 300 to 400 feet high, a mile farther up, on the opposite bank of the river. The site of the city was in an unbroken wilderness until 1811, when a settler from Louisiana planted a corn-patch on the spot now occupied by the United States building. Little Rock now has a population (1880) of 13,138. Other places of note in the State are—Hot Springs, 3554; Pine Bluff, 3283; Texarkana (partly in Texas), 3223; Helena, 3652; Fort Smith, 3099. On the Arkansas River, about 250 miles below Little Rock, is Arkansas Post, an old military station under the Spanish *régime*. At this point, in 1685, was made the first settlement within the present limits of the State (by the French), and when the Territory of Arkansas was formed, in 1819, it became the seat of government until 1821, when this was removed to Little Rock. At Hot Springs, in Garland co., on a tributary of the Washita River, about 60 miles south-west from Little Rock, are the famous hot springs. It is a place of wide repute as a resort for invalids for the cure of rheumatism and similar complaints. From seventy-five to one hundred springs, varying in temperature from 105° to 160°, Fahr., issue from a lofty ridge of sandstone, overlooking the town, while others rise in the bed of the stream near by, and make its waters warm enough for bathing in midwinter.

During the Civil War, Arkansas suffered great disturbance, and was the theatre of some important operations. In Jan., 1861, upon a vote of the people, there appeared to be a majority (27,412 to 15,826) in favor of a convention to consider the question of secession. This convention assembled about March 1st, and on the 11th was waited upon by W. S. Oldham, a member of the Confederate Congress, acting as a commissioner from Jefferson Davis, the president of the Secession organization of States. The latter had sent a message to the convention urging Arkansas to secede, but after it had been read and debated a vote resulted (39 to 35) in a decision against taking any definite step, and in favor of leaving the question to a popular vote on the 1st of August following. Before that time arrived, however, the conflict of arms began at Fort Sumter in April, and the Southern party in Arkansas became so strengthened that the convention was at once reassembled, and on May 6th passed an ordinance of secession by a vote of 60 to 1, and withdrew the submission to the people. Prior to this action the national arsenal at Little Rock had been seized by the State authorities (Feb. 8), and the arsenals at Napoleon and Fort Smith had been captured by Confederate sympathizers on April 23d and April 24th. No military operations of note took place within the State until March, 1862, when the Confederates under Gens. Van Dorn, Price, and McCulloch, having accumulated a force of about 20,000 men, moved against the national troops under Gen. Curtis, who had advanced from Missouri to positions just across the State boundary in the extreme north-western corner of Arkansas. A severe battle was fought at Pea Ridge, close to the border-line, on March 6th and 7th. The forces engaged are variously stated, Gen. Curtis placing his whole command at 10,250 men, while Van Dorn reported that he had 14,000, and other accounts assign him a much larger number, varying from 20,000 to 35,000. The issue of the battle was the retreat of the Confederates on the second day to Bentonville, 8 miles distant, after which they retired farther, and then were mostly withdrawn from this quarter, while the Union troops, proceeding south-eastward across the State, occupied Helena, on the Mississippi, on the 13th of July. The national loss at Pea Ridge (or Elkhorn) was stated by Gen. Curtis at 1351, of whom 203 were killed, while Van Dorn reported 600 killed and wounded and 200 prisoners, but the dispersion of a large part of his command prevented a complete return. In October there were some encounters in the same north-western section of the State, Gen. Blunt (Union) attacking and defeating Gen. Cooper (Confederate) near Maysville, while Gen. Herron (Union) on October 28th engaged and scattered a body of cavalry near Fayetteville. A little later Gen. Hindman, now in command of the Confederate forces in this quarter, took the offensive and attacked a column under Gen. Herron at Prairie Grove, a few miles south-west of Fayetteville, on the 7th of December. Herron, however, was joined by a column—which he had been marching to reinforce—under Gen. Blunt, and Hindman was beaten off, his loss being reported at 1317, but estimated higher, while the Union loss was 1148. About a month later a part of the national force on the Mississippi (and then ready to undertake the operations against Vicksburg) proceeded up the Arkansas River under Gen. McClernand and Admiral Porter, and took the Confederate fortifications at Arkansas Post (Jan. 11, 1863), capturing also its garrison of about 5000 men under Gen. Churchill. About the same time some Confederates under Gen. Marmaduke made a brief and unimportant campaign in the north-western section of the State, and another body, under Gen. Cabell, fruitlessly attacked a force of Union troops, under Col. Harrison, at Fayetteville, on April 18th. Early in July, attempting to break up the siege of Vicksburg, a Confederate force, under Gen. Holmes, attempted to retake Helena, which was held by Gen. Prentiss, but failed, simultaneously with Pemberton's surrender of Vicksburg. At the end of the month a force under Gen. F. Steele was organized at Helena for the capture of Little Rock, and on Sept. 10 secured possession of that city. Other Union forces then occupied and held the southern and western sections of the State, though in the spring of the following year (1864) the southern section was again invaded by the Confederates after the reverses of Gen. Banks in Louisiana, a column under Gen. Steele, which had moved south from Little Rock to aid Banks, being forced to retreat rapidly and with loss, reaching that post again on May 2d. A new State organization had been formed by the Unionists of the State by a convention sitting at Little Rock in January (and presided over by Dr. Isaac Murphy, the one member of the convention of 1861 who had voted, in April of that year, against secession). But the State was slackly held by the Union troops, and much of it was exposed to raids and ravage by the Confederates until the end of the war in April, 1865. The government remained unsettled until, in 1867, under the reconstruction acts passed by Congress, Arkansas and Mississippi were formed into the "Fourth Military District," under Gen. Ord. A registration of Union citizens was made by his instructions, and in November delegates were chosen to a convention which met at Little Rock in Jan., 1868, and framed a constitution which was ratified by a popular vote in March. On June 22d, Congress passed over the veto of Pres. Johnson a resolution admitting Arkansas to representation by Senators and Representatives, and the military commanders then transferred the government to the new civil authorities. The constitution of 1868, representing the "reconstruction" element in the State, made extensive changes in the State organization; it was superseded in 1874 by the adoption of another, sympathized with by the Southern elements of the State, and more nearly resembling the system existing before the war. This is now (1883) in force. In 1874, after a protracted dispute and some litigation as to the true result of the election of 1872 for governor, an armed collision resulted at Little Rock between the adherents of Gov. Baxter, who had been in discharge of the executive authority, and those of Mr. Brooks, who was the candidate against him at the election of 1872, and who claimed the place. Pres. Grant, being called upon to restore order, recognized Baxter as the lawful governor, and Brooks's followers dispersed. This preceded the framing of the new constitution, which was ratified on the 13th of October by the popular vote, and was proclaimed adopted by executive proclamation Oct. 30, 1874.

See Vol. II. p. 477 Am. ed. (p. 544 Edin. ed.).

ARMADILLO. Notwithstanding the rather close superficial resemblance of the armadillos among themselves, they exhibit great differences of structure, and (after excluding the *Chlamyphoridæ*) are divisible among four sub-families (*Dasypodinæ*, *Xenurinæ*, *Tolypeutinæ*, and *Tatusiinæ*), three of which have been even considered (by Gray) as worthy of family rank. These groups are distinguished by differences in the structure of the feet (especially of the carpal and tarsal and contiguous bones), skull, generative organs, lungs, and distance of the ears apart. The *Tatusiinæ* are to be contrasted with all the others, and are externally notable for their approximated ears and the development of four nipples, all the others having the ears quite wide apart and but two nipples. It is to this sub-family that the armadillo of the South-western United States (*Tatusia peba*) belongs. This species extends upward into Southern Texas and California. About ten genera and twenty species of living armadillos have been recognized in South America. (E. C.)

See Vol. II. p. 479 Am. ed. (p. 546 Edin. ed.).

ARMENIA is rather an ethnological than a geographical expression, for while the "land of the Armenians" has its natural boundaries, Armenia proper, being (according to Mr. J. Bryce, F. R. G. S., the latest and best authority on the subject) about 400 to 500 miles in length, and nearly the same in breadth, and occupying the upper valleys of the Araxes, Euphrates, and Tigris, and the lake-basins of three large lakes—viz., Lakes Gokscha, Van, and Urumiah—is held by Russia, Turkey, and Persia. Ararat, its loftiest mountain, has two peaks, the greater a little more than 17,000 feet in height, and the lesser 12,800 feet. Mr. Bryce ascended the former, though with considerable difficulty and peril. He pronounces the landscape inexpressibly grand and one of the most extensive in the world. All Armenia was at his feet, and he could trace the great rivers almost to the sea. The Armenian race Mr. Bryce estimates as numbering between 4,000,000 and 5,000,000, though not more than two-thirds of them are in Armenia. Of all the races of Western Asia, he considers them the most hopeful, and this is the judgment also of Mr. W. T. Palgrave. They are finely formed, of quick intellect and perceptions, and inclined to study; they possess remarkable tact and skill in business-matters, and are not wanting in enterprise; they are affectionate, generally truthful, not treacherous or vindictive; and they possess strong and fixed opinions on religious subjects, yet are open to argument. Gen. Loris Melikof, in the Russian service, is at present the best-known member of the race, many of whom fought bravely in the recent war with Turkey. But long centuries of oppression, and almost servitude, have deprived the people of the military habits they acquired under native leaders in their wars with the Romans, the Persians, and the Seljukes. Very few of the Armenians have embraced Islam. The Armenian Church has steadily maintained its independence of the Orthodox Greek Church and of the Church of Rome for 1400 years, although almost identical in doctrines with the former.

On the outbreak of hostilities between Russia and Turkey in 1877, Armenia was invaded (April 24) by four Russian columns under the general command of the grand duke Michael, the emperor's brother. The first advances were vigorous and successful. Ardahan was taken, Kars invested, and the main body, under Gen. Melikof, was advancing upon Erzeroum, when the Turks, under Mukhtar, Feisy, and Ismael Pashas, drove them back upon the Russian frontier, leaving only Ardahan in their hands. They were reinforced, and attacked Mukhtar Pasha at Aladsha, Oct. 2d, defeated his army, captured the right wing, and drove the rest into Kars. Kars was taken by assault, Nov. 17th, and after a second battle near Erzeroum, that city was invested, and surrendered, Feb. 21, 1878, on the conclusion of a truce. By the Treaty of San Stefano, between Turkey and Russia alone, the former ceded Ardahan, Kars, Batoum, and Bayazid, and all the territory east of the Soghanly Mountains, to the latter, in lieu of a war-indemnity of 1,000,000,000 roubles. In the revision of this treaty, effected by the Congress at Berlin, Bayazid is omitted from the ceded territory, Batoum declared a free port, and the Khotur district given to Persia.

The district thus given to Russia contains but 6687 square miles, with a population of 271,151, but is an addition to the Erivan district of Armenia, already in Russian hands, with a population of 547,693. Less than a third of the inhabitants are Armenians. The American Board of Commissioners for Foreign Missions has thirty-three Protestant congregations in Armenia, with more than 1800 members, many of them self-supporting and supplied by native pastors. The conversion of a few of their converts to Baptist views seems likely to lead to an extension of the missionary operations of the American Baptists to this field.

During the negotiation of the Treaty of Berlin, Great Britain entered into a secret compact with the sultan, by which she guaranteed to Turkey the integrity of her Asiatic possessions on condition of pledges that the Government should effect reforms in their administration, and should protect the people of Armenia from the Kurds and the Circassians. These pledges, however, have not been observed. Turkish Armenia still remains one of the most terribly oppressed countries of the world. What the pashas spare in their exactions, the Kurds destroy or carry off in their incursions. The invasion of the Kurds in 1882, under their chief Obeidullah, a vassal of the sultan, was especially destructive of life and property. Native industries are paralyzed by the wretched fiscal system, which lays large duties on exports rather than on imports, and violates every principle of sound finance in the imposition and collection of taxes. It is not wonderful that the Armenians look to Russia rather than to England as their possible deliverer, and not improbable that the Eastern Question will be reopened next in this oldest of Christian kingdoms.

An important archæological discovery was made in 1882 by a Bavarian archæologist, Herr Sester, at the point where the Euphrates bursts through the Taurus range. Here, in a wild district lying between Malatieh and Someisat (the ancient Melitene and Samosata), he found a line of megalithic monuments, averaging between 16 and 18 metres in height, and bearing inscriptions. They are in a remarkable state of preservation, and the discoverer believes that they formed part of a great national sanctuary dating back some 3000 years or more. There was formerly at this place a necropolis of the old Commagenian kings, so that it seems reasonable to attribute these colossal monuments to this ancient people, the hereditary foes of the Assyrians, who are mentioned both in the cuneiform inscriptions and by classic writers.

ARMILLARY SPHERE. See ASTROLABE.

ARMITAGE, EDWARD, an English historical painter, was born in London in 1817. He studied at the École des Beaux-Arts in Paris under Paul Delaroche, and it is said that he assisted that eminent painter in the execution of his famous Hemicycle in the lecture-room of the École des Beaux-Arts. Armitage's first essays in historical composition were ambitious in subject and in manner, Prometheus Bound being one of the themes upon which the young artist tried his 'prentice hand. The Battle of Meanee, which was produced a few years later (1847), won a prize of £500, and the painter was further honored by having it purchased by the queen. At the cartoon exhibitions in Westminster Hall in 1843 and 1845 he was awarded prizes for his Landing of Julius Cæsar and The Spirit of Religion, and he was subsequently commissioned to paint two of the frescoes in the new Parliament House. In 1849, Armitage went to Italy, where he remained for two years, residing chiefly in Rome. During the progress of the war with Russia he visited the Crimea, and from sketches and studies made there he painted his pictures of the Battles of Inkerman and Balaklava. Among his other noted works are Samson at the Mill, Aholibah, Retribution, The Mother of Moses Hiding after Exposing her Child, Pharaoh's Daughter, Burial of a Christian Martyr in the Time of Nero, The Remorse of Judas, Christ Healing the Sick, Herod's Birthday-Feast, Gethsemane, Simplex Munditiis, Julian the Apostate Presiding at a Conference of Sectarians, The Hymn of the Last Supper, and Serf Emancipation. The Julian was in the English collection at the Philadelphia Exhibition of 1876, and the Serf Emancipation at the Paris Exhibition of 1878. Armitage was elected an associate of the Royal Academy in 1867, and a full academician in 1874. The achievements of this artist have never been equal to his ambition. Lacking both high dramatic and high poetical powers, he has essayed themes which for their entirely successful treatment demand abilities of the first order. Armitage is more of a humorist than he is a poet or a dramatist, and it is the humor of his Julian and some other works that most particularly impresses the beholder. His compositions are harmonious, but artificial, while his light-and-shade is weak and his color uninteresting. The subjects of his pictures are usually well chosen, but the pictures themselves too often suggest that the artist has not had the ability to realize his own ideal. Armitage, however, is one of the best of the English historical painters of the middle period of the present century. He always has a subject, and he always presents it with some degree of force and effect. (W. J. C., JR.)

ARMSTRONG. (I.) JOHN ARMSTRONG (1720–1795), an American soldier, was born in the north of Ireland in 1720, and emigrated to America about 1745, settling in the Kittatinny Valley in Pennsylvania. In 1750 he laid out the town of Carlisle. After the defeat of Gen. Braddock in 1755, he enlisted in the provincial troops organized for the defence of the border settlements. Being made lieutenant-colonel in 1756, he conducted a secret expedition against Kittanning, an Indian village on the Allegheny River, 40 miles above Fort Du Quesne. The village was destroyed, a number of white captives released, and the stores supplied by the French were carried off. Col. Armstrong was afterwards engaged in other expeditions, and in 1758 led the advance of Gen. Forbes's army which captured Fort Du Quesne. In February, 1776, he was made a brigadier-general by the Continental Congress, and placed in command of the troops in South Carolina. In the next year he resigned his position in the Continental service, and became major-general of the Pennsylvania troops. He was engaged in erecting defensive works on the Delaware River, and took part in the battle of Germantown, Oct. 4, 1777. In 1779, and again in 1787, he was a member of Congress from Pennsylvania. He died at Carlisle, March 9, 1795.

(II.) JOHN ARMSTRONG (1758–1843), an American general, son of the preceding, was born at Carlisle, Pa., Nov. 25, 1758. In 1775, while a student at Princeton College, he enlisted in a Pennsylvania regiment, and in a short time was appointed aide to his father's friend, Gen. Hugh Mercer. After the death of the latter, Armstrong became an aide to Gen. Gates with the rank of major, and served both in the campaign against Burgoyne and in the South. At the close of the war, while the army lay at Newburg, N. Y., impatiently waiting for the conclusion of the tedious negotiations for peace, there was growing discontent among the officers and soldiers, whose families were in many cases suffering through tardy receipt of the pay promised and through the great depreciation of paper-money. Some prominent officers presented a respectful memorial to Congress setting forth their claims, but that body, through its inability to raise revenues, could give them little satisfaction. At last, March 10, 1783, an anonymous notice was circulated calling a meeting of the officers on the next day to consider their grievances. It was accompanied by a spirited address discussing the condition of the army, calling for a change in the mild tone of their former memorial, and urging them to refuse to lay down their arms unless their demands were conceded. In later years Major Armstrong acknowledged that he had written this paper, usually known as the "Newburg Address," but it was done with the approval, and probably at the suggestion, of superior officers. Washington immediately issued general orders rebuking "these disorderly proceedings," and called a meeting for the 15th. In a second anonymous address the writer attempted to show that the action of the commander-in-chief was really an indorsement of the ideas of the first address. But when the meeting convened on the 15th, Washington solemnly protested against the treasonable course advocated in the address, urged the officers to wait patiently for the action of Congress, and pledged his own efforts to secure for them the reward of their self-sacrificing and patriotic services. He then retired, and Major-Gen. Gates, as the senior officer, presided, while resolutions were adopted declaring the necessities and just claims of the officers, yet avowing confidence in the judgment of Congress. When the army was disbanded, Armstrong returned to Carlisle, and was made secretary of state, and soon afterwards adjutant-general, of Pennsylvania. In 1784 he took part in the proceedings to eject the settlers in the Wyoming Valley, who claimed the land under a grant from Connecticut. In 1789 he married a daughter of Judge Robert R. Livingston of New York, and removed to that State, settling on a farm in the old Livingston manor. For some years he devoted himself chiefly to agriculture, but in 1800 he was elected to the United States Senate. In 1804 he was appointed minister to France, succeeding his brother-in-law, Chancellor Livingston. He served also as minister to Spain, and in 1810 returned to New York. When war was declared against Great Britain in 1812 he was made a brigadier-general, and in Jan., 1813, was appointed Secretary of War. He made repeated efforts for an invasion of Canada, and in prosecution of his plans went to Sackett's Harbor to superintend the military operations, which, however, were unsuccessful in their principal object. During his tenure of office the city of Washington was captured and burnt, and, as he was commonly though perhaps unjustly blamed for this disgrace, he resigned in Sept., 1814. He afterwards published a *History of the War of 1812*, a *Review of Gen. Wilkinson's Memoirs*, and some treatises on farming and gardening. His intended *History of the American Revolution* was incomplete at the time of his death. He died at Red Hook, N. Y., April 1, 1843.

ARMSTRONG, SIR WILLIAM GEORGE, C. B., an English engineer and mechanical inventor, was born at Newcastle-on-Tyne, England, Nov. 26, 1810. His father, William Armstrong, was a merchant and alderman of that town. The son was educated at the school of Bishop-Auckland, and early manifested mechanical talent. At his father's desire, however, he studied law at Newcastle and in London, and became a partner in the firm of his preceptor. He still retained his fondness for mechanical pursuits, and in 1838 suggested an important improvement in hydraulic machinery which he called an "accumulator." His design was published in the *Mechanics' Magazine*, and then, finding no one else disposed to try it in practice, he made a working model, which proved highly successful. This led him to urge the more extensive use of water-power, and to give attention to the improvement of machinery for that purpose. Another valuable invention was the hydraulic crane, which was first explained in a lecture before the Literary and Philosophical Society of Newcastle in Dec., 1845. With the assistance of some friends Mr. Armstrong erected a crane on Newcastle quay, and its superiority to all previous lifting-machines was speedily shown. He had also made investigations in regard to electricity, and in 1842 these resulted in his invention of the hydro-electric machine, the most powerful apparatus for producing frictional electricity. In consequence of this he was elected a fellow of the Royal Society in 1846. In the same year the Elswick Engine-Works were established near Newcastle to manufacture his cranes and other heavy iron machinery. During the Crimean War his attention was turned to improvement in ordnance, and soon the breech-loading rifled cannon that bears his name was produced. In 1858, after various vexatious delays, the Armstrong gun was adopted for special service in the British army, and the inventor, on presenting his patents to the Government, was knighted and appointed chief engineer of rifled ordnance. He extended his system to cannon of all sizes, and in three years introduced 3000 guns into the service. In 1861 he began to make experiments with regard to the penetrability of iron plates. These resulted in proving that at ordinary range muzzle-loading cannon of smooth bore and large calibre are more effective than breech-loading cannon. When his original guns were tested by actual use in war, they were found to have certain defects, often causing injury to those serving them, and they have ceased to be used by the British Government. In Feb., 1863, he resigned his position as engineer and returned to Elswick. He has continued the manufacture of ordnance, and has supplied guns of huge size and terrible power both to Europe and America. In June, 1863, he presided over the meeting of the British Association at Newcastle, and delivered an address on the exhaustion of the coal-fields of Great Britain, which led to the appointment of a parliamentary commission on the subject in 1866. He received the degree of LL.D. from the University of Cambridge in 1862, and that of D. C. L. from Oxford in 1870. He has received various marks of honor from foreign countries. The Elswick Engine-Works still continue under his control, and now extend for nearly a mile along the Tyne, covering forty acres of ground and affording employment to more than three thousand workmen.

The distinguishing features of the Armstrong gun may be set forth in a few words. It is a breech-loader, built up of small bars of wrought iron to secure lightness and to avoid flaws. These are 3 feet long, and the section is 2 inches square. Heated to a white heat, these are twisted spirally around a steel tube, constituting the surface of the bore, and welded together. Others are twisted over these by similar process in an inverse direction: according to the needed strength, a third and fourth layer may be used. To strengthen the barrel at and in rear of the trunnions, two additional thicknesses are laid. The gun, thus finished, is suited to any kind of projectile—shot, shell, case, or canister. The process of loading is slow, but the following advantages are claimed for the Armstrong gun: It is very much lighter than the old gun, in the proportion of 26 to 57; it requires half the quantity of powder for a charge; it carries to a much greater distance—three to one; its fire is much more accurate; by its construction it carries to the right of the target, and so the rear-sight has a lateral motion, making an allowance for the constant deflection or drift; the fuses are so accurately adjusted that shells may be exploded with perfect confidence at the will of the gunner. There are about forty rifled grooves, and they take one complete turn in 12 feet. Subsequent improvements in artillery have invalidated to some extent these claims, though the gun is still in demand in various countries.

ARMY OF THE UNITED STATES. The military defence of the United States in case of domestic insurrection or of war with a foreign power is confided to a regular army, and to the militia of the several States when called constitutionally into the service of the United States. The former is a standing army, varying in strength according to the enactments of Congress, with a regular organization of trained officers and disciplined troops, and is a nucleus and exemplar for the far more numerous militia upon which the dependence of the country must be placed in time of war, and which, with length of service and experience in the field, become competent and veteran troops. When the emergency for which they are called is over they are disbanded. The distinction between these two forces will be kept in view in this article.

See Vol. II. p. 489 Am. ed. (p. 559 Edin. ed.).

In speaking of the regular army it is not necessary to refer at length to its form and force during the Revolutionary War. It was made up of various quotas of State troops, sent to the field by the different States upon the requisition and apportionment of Congress—the only way of procuring men for military service under the Confederation. At the close of that eventful struggle the little army was disbanded without reward or pay, and for a short time the country was without a military force or the means to support one. By section 8 of Article I. of the Federal Constitution, which went into operation in 1789, Congress was empowered to raise and support armies; and by the second section of Article II. the President of the United States was declared to be the commander-in-chief of the army and navy, and of the militia when called into the service of the United States. As this gave him the power to do what he pleased with the military forces when Congress had raised them and made provision for their support, the popular fear lest such a control might be dangerous to republican liberty caused the insertion of a provision in the Constitution that no appropriation of money for the support of the army should be for a longer term than two years. In point of fact, such provision has always been very stinted, and the standing army has always been small. On the 7th of Aug., 1789, Congress provided by a bill for creating a department of war, with a secretary who was a member of the executive Cabinet, and whose acts and orders were considered as those of the President himself.

Strength of the Army at Different Periods.—Before proceeding to present the organization of the army as it at present exists, it is important to state in aggregate its numerical strength at different periods of its brief history. In 1790, at the beginning of our constitutional government, the rank and file of the army was fixed by act of Congress at 1216 men, to which force a regiment of 900 men was added the next year. In 1792, incident to the wars with which Europe was convulsed, Congress enacted a uniform militia law throughout the United States, which has not been altered in its principal features since that time. In 1795, and down to 1800—there being no annual returns during the intervening years—the army consisted of a corps of artillerists and engineers, two companies of light dragoons, four regiments of infantry of eight companies each—in all 3440 men; and to command this force Congress authorized the President to appoint one major-general and one brigadier, with a suitable staff for each. But the next year, as the political sky of Europe seemed more serene, the major-general was discarded as an unnecessary extravagance. In 1798 the attitude of France, which from the outburst of the French Revolution had been more or less hostile, caused Congress to pass an act authorizing the President to raise a provisional army of 10,000 men "in the event of a declaration of war by a foreign power, or of invasion, or of imminent danger;" and this was followed by several corroborative and supplementary acts. George Washington was appointed lieutenant-general. The determined posture of the Government in making such a preparation and the influence of this appointment led to the removal of French indignities, and the force was not raised. In 1801 the strength of the army was slightly increased, so that it numbered 4051. In 1802 and 1803, the foreign complications being removed, it was again reduced to a peace establishment of 2576. But in 1807, by reason of the oppressive English "Orders in Council" and the retaliatory French Decrees of Berlin and Milan, which materially affected the national prosperity and paralyzed American commerce by their wholesale "paper blockades," there was a greater military activity than ever before in the country. Congress authorized the President to accept 30,000 volunteers from the States, and made large appropriations for erecting fortifications and building gunboats, the latter being a part of the system of national sea-coast defence devised by Jefferson to render a navy unnecessary. In connection with these preparations for war in 1808, the entire militia of the country was newly equipped. From that date everything tended towards war with France or England, or both. The regular army, which from 1802 to 1808 had remained at less than 3000 men, was increased in the latter year to an aggregate of 6954. The embargo laid by the Government in 1807 was followed by the Non-Intercourse Act of 1809. The hostility was decided and bitter, but the war was delayed until 1812. France withdrew her decrees, discriminating in our favor, and as England did not, war was declared against her. Preparatory to this, in January of that year an act was passed to raise an additional force, "either by the acceptance of volunteers, or by enlistment for one year, unless sooner discharged, of as many companies of rangers, not to exceed six, as the President may deem necessary." In

February another increase was provided for, and finally, on the 18th of June, 1812, when war was declared, the same act authorized the raising of 35,000 men to carry it on. The war was actually begun, however, with only 10,000. Leaving out of consideration the volunteers and militia who were accepted for limited periods, we find the strength of the regular army in Feb., 1813, to be 19,036; in Sept., 1814, 30,186; and in Feb., 1815, just at the close of the war, 33,424. The provisional forces included in this enumeration were then disbanded, so that the returns for Dec., 1816, show an aggregate of only 10,024 men. In the intervening years, up to 1821, the force was kept up to about 8000. In the latter year there was a considerable reduction and a new organization on a peace establishment, which left the force at between 5000 and 6000 men, which, with slight variations, remained during all the years until 1837, when it rose to about 8000 on account of the Indian War in Florida. There was then a slight gradual increase until 1841, when the number of troops was 11,169. During these later years the general establishment included, with occasional temporary enlargements, four regiments of artillery, seven of infantry, and the various staff corps and departments to be mentioned in the general schedule of army organization. With regard to a cavalry force, in 1832 Congress had authorized, and the President had raised, a battalion of mounted rangers, armed with rifles, for the defence of the frontier; but in 1833, in lieu of this force, Congress created a regiment of dragoons, and in May, 1836, another regiment was added. In both the First and Second dragoons most of the officers were appointed from civil life. The Florida War, in which these regiments were specially used, grew out of the forcible attempt to remove the Indian inhabitants of the Territory to the "Indian Territory" of the West; they resisted with skill and cunning, and it was not until 1846 that the last remnant consented to go. The war began in 1833, although trouble had been brewing since 1830, when Pres. Jackson first proposed the measure. It was a difficult and tedious war, both on account of the cunning of the savages and the peculiar topography of the country, which made concealment and ambush easy. In 1838, Congress created an additional regiment of infantry, the Eighth, and volunteers were employed from the contiguous States. In that year the army numbered 8653, and in the next year 9704. The Florida War was nominally ended by a treaty with the Indians in 1839, but it still burst forth from time to time. In 1841 the force of the army was 11,169 men, but in 1843 it had fallen to 8935.

In 1845, when the United States annexed Texas, a revolted province of the Mexican republic which had achieved its independence, a war with that power resulted. Although during the winter of that year a force was established on the frontier and war was imminent, actual hostilities did not take place until the spring of 1846, when the battles of Palo Alto and Resaca de la Palma were fought on the 6th and 7th of June. This war caused a provisional increase of the army and the call for a volunteer force. The report of the adjutant-general made after the treaty of peace in April, 1848, shows that at the commencement of the war the aggregate of line troops in the regular army was 7244, of whom 3554 only were with Gen. Taylor in the first battles. The total number of regulars enlisted during the war was about 20,000. The additional force was thus organized: in 1846 was raised a regiment of mounted riflemen, which served mostly on foot during the war; in Feb., 1847, a third regiment of dragoons was created, as were also nine additional regiments of infantry, of which one was of voltigeurs. Besides these regular troops, more than 50,000 volunteers were employed for various terms of service. After the treaty of peace in April, 1848, the volunteers and additional regular force were brought home and discharged, according to a provision in the acts creating them. The mounted rifles were retained, to be transformed somewhat later into a regular cavalry regiment. With these changes the strength of the army was substantially the same as before the war.

The Mexican War added largely to our territory by conquest and purchase; an unprecedented tide of immigration poured to the West, and there were gradual but constant changes in the military establishment. The rank of lieutenant-general, which had not existed since the days of Washington, was revived and conferred upon Gen. Winfield Scott, the conqueror of Mexico, with the proviso that it should again cease to exist when he died. In 1855 the Ninth and Tenth permanent regiments of infantry and the First and Second cavalry were organized, and thus the army remained until the breaking out of the Civil War in the spring of 1861.

Up to that time, in the opinion of military men, the regular army had been inadequate to the demands of the frontier service. Its situation was now somewhat changed. The "day of small things" in all military operations had passed by, and there was no longer a disposition to confine the army appropriations within the narrowest limits. But the regular army was not to receive an increase proportionate to the greater gravity of the situation. It was still to serve as the nucleus and the model of organization for the vast numbers of volunteer troops mustered into the service of the United States. April 15, 1861, two days after the attack on Fort Sumter had announced the opening of civil war, Pres. Lincoln issued his call for 75,000 troops for three months' service, and on May 3d he called for 42,000 more, to be enlisted for three years or during the war. On July 22d, in consequence of the disastrous result of the battle of Bull Run, which had been fought on the previous day, Congress authorized the President to receive into the service 500,000 volunteers to serve for such various terms as he might deem proper, ranging from six months to three years or during the war. The work of mustering in and organizing this force was hurried forward with great zeal and enthusiasm. On the 25th of July he was again authorized, in terms somewhat vague, to call out 500,000 men. Whether so intended or not, he had in reality the right to receive 1,000,000 men, "with such number of major-generals and brigadiers as in his judgment are required for the organization." In the same month (July 29) the regular army was increased by the formation of nine additional regiments of infantry, one of cavalry, and one of artillery: the infantry regiments were to be very large—of two or three battalions of eight companies each. The new regiment of artillery (the Fifth) was composed of twelve batteries. In June, 1862, a premium of $2 was offered for each recruit in the regular army; in July medals of honor were created.

During the entire Civil War there were, including re-enlistments, 2,690,401 men in the field, regulars and national militia. These were, in the main, and not counting detachments, divided into great armies with corresponding departments, as those of the Potomac, the Tennessee, the Cumberland, and the Ohio. Such organizations were sometimes merged, as in the case of the last three, which were formed into the military division of the Mississippi on the 16th of Oct., 1863. These troops were raised in various ways—by the proclamation of the President, by accepting volunteers formed into regiments, by enlistment in the regular army, and also by conscription or draft when other means seemed to fail. The militia and volunteers were paid by the United States, but to the States was reserved the right to appoint the field and line officers. Towards the close of the war, when ordinary modes of recruiting began to fail, recourse was had to bounties, which rose to $1000, and even $1500, for each man.

When the war was over there were disbanded 1,100,000 men, the regular army only being retained. In June, 1861, it had numbered 16,422. From 1862 to 1864 the annual returns were suspended. On the

1st of May, 1865, it contained 22,310 men. Allowing for deserters, absentees unaccounted for, etc., it may be said that when the Confederates laid down their arms at Appomattox Court-house the Federal army counted a million and a quarter of men under arms—a number greater than any recorded in history since the invasion of Greece by the Persian hosts of Xerxes.

In 1867 the strength of the regular army was 56,815; in 1868, 50,916. In 1870 it was limited to 30,000. In June, 1878, it was reduced to 25,818. In the army register of Jan., 1882, the numbers are stated at 28,400. An act of Congress of Feb., 1881, appropriating money for the support of the army, provides that it shall thereafter be recruited only up to 25,000 men.

Present Organization of the Army (1883).—It consists of 1 general, 1 lieutenant-general, 3 major-generals, 6 brigadier-generals, with their respective staffs, selected from the officers of the army; 5 regiments of artillery; 10 regiments of cavalry; 25 regiments of infantry; an adjutant-general's department; an inspector-general's department; a quartermaster's department; a subsistence department; a corps of engineers and a battalion of 200 engineer soldiers; an ordnance department, with 464 enlisted men; the medical department, with 150 hospital stewards; a pay department; a chief signal-officer, with 500 enlisted men; a bureau of military justice, with 8 judge-advocates; 30 post chaplains and 4 regimental chaplains; the officers on the retired list, 400; the professors and cadets of the U. S. Military Academy.

To examine these more in detail. The five regiments of artillery number 2905 men. Each regiment consists of twelve batteries, and one of them is equipped as a battery of light artillery; each battery is fixed at a maximum of 122 privates. When the President deems it necessary a second may be so designated. The artillery arm was organized in May, 1794, there being a corps of artillerists and engineers. These were divided in 1802 into a corps of engineers and a regiment of artillery. The total of the ten regiments of cavalry, of which two are colored regiments, is 8402, and each regiment comprises twelve troops, each containing 78 privates. The twenty-five regiments of infantry number 13,502 men, each regiment containing ten companies, the number of privates in each company ranging, at the President's discretion, from 50 to 100 men. The privates and non-commissioned officers of two of these regiments are colored men.

The adjutant-general's department, established in 1813, the bureau of which is in the War Department at Washington, is composed of 1 brigadier-general (adjutant-general), 2 colonels, 4 lieutenant-colonels, and 10 majors (assistant adjutant-generals); total, 17. Of these officers, some are detailed for service at the division and department headquarters of the generals, the others being in the bureau at Washington.

The inspector-general's department comprises 1 brigadier-general, 1 colonel, 2 lieutenant-colonels, and 1 major; total, 5. In the quartermaster's department are 1 brigadier (quartermaster-general), 4 colonels, 8 lieutenant-colonels, 26 majors, and 18 captains; total, 57. In this department there are also 7 military storekeepers, with the rank of captain. The subsistence department numbers 1 brigadier-general (commissary-general of subsistence), 2 colonels, 3 lieutenant-colonels, 8 majors, and 12 captains; total, 26. The corps of engineers is commanded by a brigadier-general (the chief engineer), and has a regimental organization through all the grades down to second lieutenant. It contains 110 officers and 200 enlisted men; total, 310. The ordnance department has a similar organization, excluding second lieutenants, commanded by a brigadier-general (chief of ordnance) and comprising 64 officers, including 10 ordnance storekeepers with the rank of captain, and 400 enlisted men; total, 464. The medical department, commanded by a brigadier (surgeon-general), has 196 officers, with assimilated rank of colonel, lieutenant-colonel, major, captain, and first lieutenant, and 150 hospital stewards. The pay department has a paymaster-general (brigadier) and 54 paymasters, ranking as colonels, lieutenant-colonels, and majors. The signal corps has, besides the chief signal officer (a brigadier), four second lieutenants. In the bureau of military justice are 1 judge-advocate-general (a brigadier) and 7 judge-advocates with the rank of major. The 3 post and 4 regimental chaplains have the assimilated rank of captain.

The Military Academy at West Point is a growth from very small beginnings; designed originally to be a constituent part of the engineer corps, it has become a feeder to every arm of the service. By an act of March 16, 1802, the corps of engineers was stationed there, and the military academy was established, although its officers might be called on by the President to do duty anywhere in the country. By an act of April 29, 1812, there were created professors and teachers of mathematics, natural and experimental philosophy, and French, with specific assimilated rank and pay, not entitling them to command of troops or posts. By the same act a corps of cadets was created, not to exceed 250 in number, with specific directions as to age, qualifications, etc. The course comprises four years. In the year 1846 a board of visitors was established, that the country might have an outside report of the manner in which the institution was conducted. In 1866 it was enacted that cadets should be appointed one year in advance, to give them time to prepare, and in the same year the post of superintendent, which had thus far been confined to the corps of engineers, was thrown open to any arm of the service. The departments and subjects of instruction have steadily increased in number. In 1875, West Point was erected into a military department, and a major-general became superintendent, but in 1882 it again became only a military post as before. Officers of the army are detailed for duty as assistant professors in the departments of instruction. The entire number of professors, instructors, cadets, etc., at the academy is 321.

The Retired List.—In this list are found the names of commissioned officers who are relieved from service on account of age, sickness, or any disability by reason of which they are unable to do their duty. It began with an act of Congress passed Aug. 3, 1861, by which, after forty consecutive years of service, an officer may, upon his own application, be retired by the President. Any officer, whatever his term of service, if judged incapable of performing his duties, may be retired, provided that there shall not be more than 7 per cent. of the whole number of officers on the retired list. This limit was removed at a later time. On the 17th of July, 1862, it was enacted that when an officer had served forty-five years or was sixty-two years old he might be retired at the discretion of the President. In July, 1870, an act was passed that any officer who had been thirty years in service might, on his own application, be retired. By the act of Congress of June 18, 1878, the number of officers on the retired list is limited to 400, so that officers having good grounds for retiring must wait for vacancies. The pay of retired officers is 75 per cent. of the pay of the rank upon which they are retired.

Besides the numbers mentioned, there are 262 men of the non-commissioned staff and unattached, 468 enlisted men unattached, and about 300 Indian scouts. These bring the aggregate of the present army, as before stated, to 28,402 men. The terms of enlistment is fixed at five years, with certain privileges for re-enlistment.

Army Regulations.—The manual of duty and the rule of life for the soldier are found in the *Regulations for the Army of the United States, and General Orders in Force.* They contain a digest of all the laws relating to the military service, define and prescribe the duties of every officer, give all forms and modes of performing every specific service; every possible detail is considered and provided for. By the act of Congress of March 3, 1813, the Secretary of War was required to prepare general regulations for the army. These were enlarged and modified after the treaty of peace in 1816, and the titles were largely increased in the intervening years until the close of the Civil War in 1865, when all army affairs were put upon a new and more permanent basis. Some changes were made in 1870, but the regulations were finally codified and issued in Feb., 1881, by order of the Secretary of War and under the direction of the adjutant-general of the army.

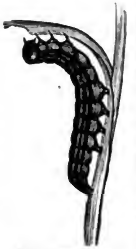
The following table shows the pay of all officers:

Grade.	Pay of Officers in Active Service.						Pay of Retired Officers.					
	Yearly Pay.	Monthly Pay.					Yearly Pay.	Monthly Pay.				
		Prior to 5 years' service.	5 years' service.	10 years' service.	15 years' service.	20 years' service.		Prior to 5 years' service.	5 years' service.	10 years' service.	15 years' service.	20 years' service.
			10 per ct.	20 per ct.	30 per ct.	40 per ct.						
General	$13,500.00	$1,125.00										
Lieutenant-general	11,000.00	916.67										
Major-general	7,500.00	625.00	....	....	....	....	$5,625.00	$468.75				
Brigadier-general	5,500.00	458.33	....	....	....	....	4,125.00	343.75				
Colonel	3,500.00	291.67	$320.83	$350.00	$375.00	$375.00	2,625.00	218.75	$240.62	$262.50	$281.25	$281.25
Lieutenant-colonel	3,000.00	250.00	275.00	300.00	325.00	333.33	2,250.00	187.50	206.25	225.00	243.75	250.00
Major	2,500.00	208.33	229.17	250.00	270.83	291.67	1,875.00	156.25	171.87	187.50	203.12	218.75
Captain, mounted	2,000.00	166.67	183.33	200.00	216.67	233.33	1,500.00	125.00	137.50	150.00	162.50	175.00
Captain, not mounted	1,800.00	150.00	165.00	180.00	195.00	210.00	1,350.00	112.50	123.75	135.00	146.25	157.50
Regimental adjutant	1,800.00	150.00	165.00	180.00	195.00	210.00						
Regimental quartermaster	1,800.00	150.00	165.00	180.00	195.00	210.00						
First lieutenant, mounted	1,600.00	133.33	146.67	160.00	173.33	186.67	1,200.00	100.00	110.00	120.00	130.00	140.00
First lieutenant, not mounted	1,500.00	125.00	137.50	150.00	162.50	175.00	1,125.00	93.75	103.12	112.50	121.87	131.25
Second lieutenant, mounted	1,500.00	125.00	137.50	150.00	162.50	175.00	1,125.00	93.75	103.12	112.50	121.87	131.25
Second lieutenant, not mtd	1,400.00	116.67	128.33	140.00	151.67	163.33	1,050.00	87.50	96.25	105.00	113.75	122.50
Chaplain	1,500.00	125.00	137.50	150.00	162.50	175.00	1,350.00	112.50	123.75	135.00	146.25	157.50

The maximum pay of a colonel is by law $4500 per annum; hence full 40 per cent. cannot accrue. The maximum pay of a lieutenant-colonel is by law $4000 per annum, hence full 40 per cent. cannot accrue. An aide-de-camp to a major-general is allowed $200 per year in addition to the pay of his rank, not to be included in computing the service increase. An aide-de-camp to a brigadier-general is allowed $150 per year in addition to the pay of his rank, not to be included in computing the service increase. Acting commissary of subsistence is allowed $100 per year in addition to the pay of his rank, not to be included in computing the service increase. Assistant surgeons are entitled to the pay of captain after five years' service. Retired officers receive 75 per cent. of the pay (salary and increase) of their ranks, but no increase accrues for time subsequent to date of retirement. A retired chaplain receives three-fourths of the pay (salary and increase) of his rank (captain, not mounted). The officer in charge of the public buildings and grounds (Washington) has, while so serving, the rank, pay, and emoluments of a colonel. The aides-de-camp to the general, selected by him from the army, have, while so serving, the rank and pay of colonel. The aides-de-camp and military secretary to the lieutenant-general, selected by him from the army, have, while so serving, the rank and pay of lieutenant-colonel. Officers of the army and of volunteers, assigned to duty which requires them to be mounted, shall, during the time they are employed on such duty, receive the pay, emoluments, and allowances of cavalry officers of the same grade, respectively. Mileage, at the rate of eight cents per mile, is allowed to officers for travel under orders. Commutation of quarters to be paid by the pay department, as follows: general, $125 per month; lieutenant-general, $70 per month; all other grades not to exceed $10 per month per room. Privates of artillery, cavalry, and infantry receive from $13 to $18 per month, according to their length of service; corporals, from $15 to $20, and sergeants from $17 to $22. The privates also receive one ration daily; the sergeants of ordnance, one and a half.

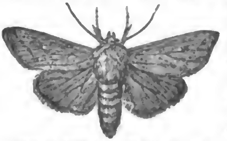
For fuller and more detailed information concerning the army reference is made to the *United States Army Regulations* (1881); Callan's *Military Laws of the United States from 1776 to 1863; General Orders of the War Department*, especially from 1861 to 1880; Winthrop's *Digest of Opinions of the Judge Advocate-General;* Scott's *Analytical Digest of the Military Laws of the United States;* Benét's *Military Law* (1862); Cullum's *Biographical Register of the Officers and Graduates of the U. S. Military Academy* (1868); *Official Army Registers*, from the earliest time to January, 1882; and other cognate publications. (H. C.)

ARMY-WORM (*Leucania unipuncta* Harr.). This insect is found in all parts of the world, but only in North America is it known as particularly destructive. It has been constantly studied by entomologists for nearly thirty years past, yet only in the last few years have certain important points been ascertained which complete our knowledge of its life-history. In the Northern States there are usually three generations in the course of a year; in the Southern States, four or five, and in all probability occasionally six. The injurious brood is usually the second of the season.



The Army-Worm.

The insect hibernates both in the moth or imago and in the larva state, while in mild winters at the South (even as far north as Maryland) a succession of generations is kept up through the winter. The eggs are preferably laid in rows of from ten to fifty in a folded grass-blade or in the sheath of a stalk of stubble, in localities where the growth is rank and coarse, as in the vicinity of fodder-stacks; and the moths have even been found to oviposit in old corn-stalks, under the dry leaf-sheath. The eggs are always concealed, no matter what their locality. The larvæ live normally as cut-worms, feeding at night and remaining concealed during the day, and only when occurring in enormous numbers do they take on the habit of marching from field to field in search for food; which habit has suggested their popular name. The duration of the larva state is from two to four weeks, or much longer in the winter months, and the pupa is formed beneath the surface of the ground. The pupa state lasts from two to three weeks.



Leucania unipuncta, parent of Army-Worm.

Ordinarily, the food of the army-worm consists of the grains and grasses, but when marching and pressed by hunger it will devour clover and many garden vegetables. Thus the worms have been known to feed on flax, and (as shown in the third report of the U. S. Entomological Commission, p. 117) have passed through their transformations when exclusively fed upon any of the following plants: garden-poppy, beet, lettuce, cabbage, raspberry, onion, parsnip, radish, carrot, and pea. They refused to feed, however, on bean, cotton, grape, and hemlock, while on strawberry they fed slightly, but died. It will be noticed that eight botanical families are represented among the plants on which they thrived—viz.: *Papaveraceæ*, *Chenopodiaceæ*, *Compositæ*, *Cruciferæ*, *Rosaceæ*, *Liliaceæ*, *Umbelliferæ*, and *Leguminosæ*.

It may also be well to state, finally, that, like its Southern analogue, the grass-worm (*Laphygma frugiperda*), the army-worm when on the march does not hesitate at cannibalism to satisfy its hunger, and many are killed and devoured by their stronger fellows.

All attempts to explain the influence of the weather upon the periodical appearance of the army-worm have resulted in the simple conclusion that following a year of extreme dryness we may more certainly expect the worms than after a year of average rainfall.

About a dozen true parasites of the army-worm have been recorded, and its natural enemies among the predaceous beetles and insectivorous birds are very numerous.

Remedies.—Annual burning of fields, straw-piles, weeds, and other rubbish as late as possible in the spring will do more than anything else toward preventing the disastrous appearance of the worms. When they have appeared in force they can be prevented from passing from one field to another by judicious ditching. The side of the ditch toward the field to be protected should be dug under, and about every three or four rods a deep hole should be dug, in which the worms will collect, so that they may be killed by covering them with earth and pressing it down. The use of the ditches may be further supplemented by dusting the grass upon its farther side for a strip a few feet wide with Paris green or London purple mixed with flour or plaster. As a substitute for ditching, where fence-lumber can be easily obtained, a line of it may be set up on edge and the top smeared with kerosene or coal-tar, preferably the latter.

Where the crop of a field has been completely destroyed by the worms, the plan of killing them by heavy rollers has been tried. This, however, is an expensive remedy, and is not as satisfactory as might be supposed. Experiments on Long Island in 1880 proved that even where the ground was level the rollers soon became irregularly covered with mud composed of earth and the juices of the crushed worms, so that the effect was much the same as if the ground had been uneven, and many worms escaped in consequence.

The remedy of "drawing the rope," as it may be termed, was practised as long ago as 1770. In regard to this remedy it may be well to say that while tolerably efficacious when the worms are not present in overwhelming numbers, or when the crop is far advanced and the stalks are large and tough, under opposite circumstances it will be of little avail; and it will always be a question whether the portion of the crop saved by this means will be worth the great expenditure of time and labor which this remedy calls for.

The following are the more important articles on this insect to which the reader may refer:

Fitch, Asa: "The Army-Worm," *Trans. N. Y. State Agric. Soc.*, 1860, vol. xx.; Kirkpatrick, John: "The Army-Worm (*Leucania extranea*)," *15th An. Rep. State Board of Agriculture of Ohio*, 1860, pp. 350-358; Packard, A. S., Jr.: "The Army-Worm," *6th Rep. Secretary Maine Board of Agriculture*, 1861, pp. 130-142; Riley, C. V.: *8th An. Rep. of State Entomologist of Missouri*, pp. 22-56, 1876; "The Army-Worm: Further Notes and Experiments," *9th Rep. of Entomologist of Missouri*, 1877, pp. 47-50; "Complete Life-History of the Army-Worm," *Massachusetts Agricultural Rep.*, 1878; Thomas, Cyrus: *10th Rep. of the State Entomologist of Illinois* (1880), pp. 5-43; Walsh, B. D.: *Trans. Illinois State Agricultural Society*, iv. (1861), pp. 349-372.

(C. V. R.)

ARNASON, Jón, an Icelandic writer, born at Hof, in the north of Iceland, Aug. 17, 1819. He was the son of a Lutheran priest, but when a child lost his father, and was educated by his mother until he was able to enter the college at Bessestad, the only school in Iceland at that time. For some time he served as private tutor in the house of the lexicographer, Sveinbjörn Egilsson. Arnason studied thoroughly the history and literature of Iceland, and in 1849 he became custodian of the national library in Reykjavik. He has published many biographical, historical, and literary sketches, and a volume of folk-tales with Magnus Grimsson (1852), but his chief fame rests on his *Islenzkar Thjódsögur og Æfintyri* (2 vols., Leipsic, 1862–64), which is a magnificent collection of Icelandic nursery-tales. They have been translated, in whole or in part, into Danish, German, and English—into the latter language by E. J. Powell and Eiríkr Magnússon, in 2 vols. (London, 1864, 1866). As a collector of folk-tales Jón Arnason ranks with the brothers Grimm, P. C. Asbjörnsen, and Afanasieff.

ARNIM, Count Harry Karl Eduard von (1824–1881), a German diplomatist, was born at Moitzelsitz in Pomerania, Oct. 3, 1824, of the noble family of Arnim-Suckow. He was adopted by his uncle, Baron Heinrich Alexander von Arnim, Prussian minister of foreign affairs, and after a brilliant academic career graduated at the University of Berlin. Having entered the diplomatic service, he was made in 1864 the Prussian ambassador at Rome, and continued there after the formation of the North German Confederation. In July, 1870, in acknowledgment of his services, he was made a count, and at the close of the Franco-German War he was called to Versailles to assist in adjusting the terms of peace. He also took part in the supplementary agreement made at Frankfort, and in June, 1872, was appointed ambassador to France. In this position he took advantage of his confidential relations with the emperor to oppose the policy of the chancellor, Prince Bismarck. He favored the designs of the French Legitimists, and assisted in bringing about the overthrow of the administration of M. Thiers. He was then recalled from Paris and appointed ambassador to Turkey, but before he went to Constantinople his despatches from Rome were published at Vienna. Though the count denied that this was done by his permission, he was placed on half-pay, and in October was arrested and imprisoned on the charge of purloining state documents from the German archives at Paris. He was tried at Berlin, and sentenced to three months' imprisonment for removing public documents, but this sentence was not executed, as he had gone abroad. An appeal to a higher court resulted in the increase of the term of imprisonment, but the count remained in Switzerland, where he published anonymously a pamphlet, *Pro Nihilo* (Zurich, 1875), in which the prosecution was attributed to a personal quarrel between Prince Bismarck and the count. This led to a further trial, in which Count Arnim was convicted Oct. 12, 1876, of lese-majesty, and sentenced to five years' penal servitude. In 1878, Count Arnim removed to Prague and published a pamphlet, *Der Nuntius kommt* (Vienna, 1878), which was soon followed by another, *Quid faciamus nos?* (1879), in which he discussed in more moderate terms the religious question in Germany. He also expressed a willingness to return to stand his trial on the charges against him, but the Government refused to give him a new trial. He died at Nice, May 19, 1881.

ARNOLD, Arthur, an English editor, author, and member of Parliament, was born May 28, 1833. He is the third son of Robert Coles Arnold, J. P., of Wharton, Frankfield, Sussex. During the cotton famine he was appointed in 1863 assistant commissioner under the Public Works (Manufacturing Districts) Act, and resided in Lancashire till the end of the famine in 1866. On retiring from this position he received the thanks of the Poor Law Board and various local authorities for his efficient services. He then spent two years in travelling in South-eastern Europe and Africa, and on his return to England in 1868 published two volumes describing his tour under the title *From the Levant.* For this work he received in 1873 from the king of Greece the golden cross of the order of the Redeemer. He became editor of *The Echo*, a Liberal journal, which under his direction has attained great success. In 1873 he was a candidate for a seat in Parliament from Huntingdon, but was defeated. In 1880 he was elected as member from Salford. In early life he published two novels—*Ralph; or, St. Sepulchre's and St. Stephen's*, and *Hever Court*. In 1878 he published *Social Politics*, and in 1880 *Free Land*.

ARNOLD, Benedict (1741-1801), was born at Norwich, Conn., 14th January, 1741. He was a descendant of the William Arnold associated with Roger Williams in the first settlement of Rhode Island. Benedict, son of William, succeeded Roger Williams as president of that colony, and for several years was governor. Gen. Arnold was the great-grandson of Gov. Benedict Arnold.

He had a fair common-school education, with some knowledge of Latin and mathematics. After serving as an apprentice in a drug-store at Norwich, he removed to New Haven, opened a drug- and book-store, and acquired considerable property. Extending his business, he engaged in trade with Canada and to the West Indies. On a visit to Honduras he challenged, and fought a duel with, an English captain for some insult to him as a Yankee. On the 27th February, 1767, he married Margaret, daughter of Samuel Mansfield, sheriff of the county. They had three sons—Benedict, Richard, and Henry. At the time of the battle of Lexington (April 19, 1775) he was captain of the Governor's Guards. He immediately called his company together and proposed to lead them to Boston; they nearly all volunteered, and started the next morning.

He proposed an expedition to capture Ticonderoga and Crown Point, and was sent by Massachusetts, and on the way met Col. Ethan Allen leading an expedition for the same object. They entered and captured the fort on the 10th May, 1775. Arnold, four days thereafter, captured St. Johns. On his return to Cambridge, Gen. Washington, on the 11th September, despatched Col. Arnold with 1100 men through the wilderness of Maine to capture Quebec. After almost incredible hardships the expedition arrived opposite Quebec, and on the 13th December they climbed to the Plains of Abraham, hoping the enemy, who was greatly superior in number, would attack; but the British kept behind their walls. On the 31st December, Arnold having been joined by Gen. Montgomery, a combined attack was made upon Quebec. Montgomery was killed, and Arnold's leg was broken by a musket-ball as he was leading a desperate charge. For his gallantry and skill Congress promoted him to the rank of brigadier-general, and Washington wrote, saying, "It is not in the power of any man to command success. You have done more—you have deserved it."

On the 11th October, 1776, having been placed in command of the fleet on Lake Champlain, he fought a desperate naval battle with the greatly superior force of the British under Sir Guy Carleton. After fighting until dark, he managed during the night, with his vessels, to pass through the British lines towards Crown Point. The next day, Arnold, in the *Congress*, bringing up the rear, was overtaken by Carleton, and with his single ship continued the fight with the British fleet until his other vessels escaped, when he ran the *Congress* ashore, burned her, and with his men made his retreat to Ticonderoga.

On the 19th February, 1777, Congress elected five major-generals, each the junior of Arnold, and one of them taken from the militia, and none of them having at that time seen much service. Washington immediately wrote to Arnold, "begging him not to take any hasty steps," and assuring him that he would endeavor to remedy the "error."

In April, 1777, while on a visit to his home at New Haven, he heard of the invasion of Connecticut by Gov. Tryon. Calling for volunteers, he hastened to Ridgfield, and there, with about 500 men, erected a barricade and awaited the approach of the British. With his small force he held the enemy until he was nearly surrounded. He received at a few yards' distance the fire of a whole platoon. His horse fell dead, receiving nine bullets, but he was not hit. Killing with a pistol from his holster a British soldier who was about to run him through with his bayonet, he sprang into the woods and escaped. Rallying his troops, he followed the English towards their ships, and at Compo his second horse was wounded and disabled, and he himself again escaped with a bullet through his coat.

Congress voted him a horse and thanks, but did not give him the rank he claimed. He sent in his resignation, but on the day it was presented Congress received a letter from Washington stating that Gen. Burgoyne was advancing from Canada, and recommending that they send Gen. Arnold to the northern department. On the 12th July, 1777, Washington again urged Congress to send Arnold north "without a moment's loss of time." He immediately started, declaring that he would "do his duty faithfully in the rank he then held, and trust to the justice of his claims for future reparation." He joined the army under Gen. Schuyler, and volunteered to lead an expedition up the Mohawk to relieve Fort Stanwix, besieged by a large force of British and Indians under St. Leger. Having relieved Fort Stanwix, he hastened back to the main army, and in the first battle of Bemis Hights, fought on the 19th October, 1777, he commanded the left wing, which was attacked, and fought the battle with his usual gallantry. Meantime, a quarrel between Gates and Arnold had been carried so far that Arnold asked and obtained permission from Gates to join Washington.

On his intention to leave being known to the soldiers, great excitement arose. An address from many of the officers and colonels of his division was signed, returning him thanks for his services, and particularly for his conduct during the late action, and requesting him to stay. He did not leave, but was not restored to his command. In the midst of the decisive battle of the 7th October he placed himself at the head of the troops he lately commanded, and led repeated attacks against the enemy. At length, while leading a desperate charge against the Hessian intrenchments, as he was entering the sally-port his horse was shot under him and a musket-ball shattered his thigh.

Congress now sent through Gen. Washington his commission of major-general, antedating it so as to confer the rank to which he was entitled, and which Washington declared "an act of justice."

In June, 1778, still suffering from his wound, he was appointed to the command of Philadelphia. Here he was involved in a quarrel with President Joseph Reed and the authorities of Pennsylvania. They made charges against him upon which he was tried by court-martial. He was acquitted of all the charges involving intentional wrong, but in regard to others the court declared his conduct had been "imprudent and improper," and they sentenced him to receive a reprimand from the commander-in-chief. Washington discharged the duty thus imposed with generous delicacy. He dwelt more upon the brilliant qualities of Arnold as a soldier than upon this "imprudent and improper deportment" for which he had been condemned, and he exhorted Arnold to "exhibit anew those noble qualities which have placed you on the list of our most valued commanders," and assured him that he would furnish him with opportunities of regaining the esteem of his country. Soon after Washington offered him the command of the left wing of his own army. But the alleged injustice of Congress and the disgrace of a public reprimand seem to have driven him to desperation. While in command at Philadelphia he had married Miss Margaret Shippen, a daughter of Edward Shippen, afterwards chief-justice of Pennsylvania, his first wife having died while he was absent on the Canadian campaign. Through this connection he was brought into social relations with the Tories of that city, and a treacherous correspondence was opened with Sir Henry Clinton. On the last day of July, 1780, Arnold visited the camp of Washington, and was tendered the command of the left wing. He declined on the ground of his inability to perform active service in the field, not having yet recovered from the wound received at Saratoga. He asked and obtained the command at West Point, to which place he repaired in August, 1780, and fixed his quarters at Beverly, the country-seat of Col. Beverly Robinson, a Virginia Loyalist holding a commission in the British army and in the full confidence of Clinton.

From this place the treasonable correspondence with Clinton was continued, until it finally resulted in an agreement on the part of Arnold to surrender West Point—the key to the communications between the Northern and Southern States—to the British. The correspondence was conducted on the part of Clinton by Major André, who signed his letters, "John Anderson," and by Arnold under the name of "Gustavus." Finally, to consummate the conspiracy, an arrangement was made that there should be a personal interview between Arnold and André. André came up the Hudson from the British head-quarters in the English war-sloop the *Vulture* and on the night of September 21st the conspirators met and arranged the details of the surrender. André accompanied Arnold to the house of Joshua Hett Smith. While there, Col. Livingston, in command of the American outposts, compelled the *Vulture* to move down the river, leaving André on shore. Meanwhile, Arnold having furnished André with plans and statements of the strength of West Point, which André concealed in his boots, also a pass or safe-conduct for his return to New York, they separated. Arnold returned to his quarters, and André started by land for New York. He was captured on the 23d near Tarrytown, discovered to be a spy, and the papers found in his boots were sent to Washington, who was approaching West Point from Hartford. Col. Jameson, the officer in whose custody André was placed, immediately informed Arnold of the capture. This intelligence reached Arnold on the morning of the 25th. A part of the staff of Washington had already reached Beverly, and while he, with Mrs. Arnold and the staff-officers, was at the table at breakfast, the intelligence of the capture of André was brought to him. He excused himself, took a hurried leave of his wife and child, and fled to the *Vulture*. The papers taken from André, disclosing the treason, reaching Washington, he made instant arrangements to defeat the conspiracy. Arnold reached New York on the evening of the 25th. André was tried and executed as a spy. Arnold received from the British the commission of general in the army, and the sum of £6315. "to cover," as he said, "losses resulting from his joining the British." Mrs. Arnold subsequently received a pension of £500 per annum.

Arnold afterwards commanded British expeditions against Virginia and into Connecticut. In December, 1781, he, with his family, sailed for England. He was received by the king and his ministers with consideration, but very coldly by the opposition. At the request of the king and the ministry he prepared and submitted a plan for reconciliation and reunion between the Crown and the colonies. He declared a "reunion of the British empire, with the rights and privileges of the colonies unimpaired, including their perpetual exemption from taxation," a necessity.

Seeking in vain employment as a soldier, he engaged in various commercial employments, but without success. On the 31st May, 1792, the earl of Lauderdale, in the House of Lords, in an attack on the duke of Richmond, compared the duke's apostasy to that of General Arnold. Arnold, through his second, Lord Hawke, challenged Lord Lauderdale, and the parties met. Lord Lauderdale received Gen. Arnold's fire, but did not return it. After some explanation Lord Lauderdale said "he did not mean to asperse Gen. Arnold's character," and the affair ended.

In 1797, Gen. Arnold received a grant of 13,400 acres of land in Canada, and "in consideration of his gallant and meritorious conduct in Guadeloupe" his residence in Canada was waived. He died in London, 14th June, 1801.

The infamy of his treason can never be obliterated by his brilliant military career. He left by his second wife four sons and one daughter. The sons all received commissions in the British army. Edward Shippen, the eldest, born in Philadelphia, March 19, 1780; died in Bengal, December 13, 1813. He was paymaster-general of the British army in India. James Robertson, born in New York, August 28, 1781; died December 27, 1854. He attained the rank of lieutenant-general, serving for more than half a century. He was military aide-de-camp to George IV., and K. H.; he was also Knight of the Crescent. George, born September 5, 1787; died November 1, 1828; lieutenant-colonel of the Second Bengal Cavalry. William Fitch, born June 25, 1794; captain of the Nineteenth Royal Lancers; died November 7, 1846. (I. N. A.)

ARNOLD, Edwin, an English poet, Sanskrit scholar, and journalist, born June 10, 1832. He was the son of a Sussex magistrate, and after his early training at King's School, Rochester, he made his studies at King's College in London, whence, obtaining a scholarship, he went to Oxford. In 1852 he was awarded the Newdegate prize for English verse for a poem entitled *The Feast of Belshazzar*. The next year he was appointed to deliver the students' address to the earl of Derby on his inauguration as chancellor of the university. Immediately after his graduation in 1854 he was made second master in King Edward VI.'s College at Birmingham, but was soon after sent to India as principal of the Sanskrit College at Poonah in the presidency of Bombay, with a fellowship in the University of Bombay. He held this position from 1857 to 1861. In the latter year, while on a vacation in England, he saw an advertisement in the *Athenæum*, that a "leader-writer" was wanted for a daily newspaper. He answered it, and thus entered upon the editorial staff of the *Daily Telegraph*, with which he has been ever since connected. He has been a constant and earnest writer, his personal experience enabling him to speak with authority on Eastern questions. At his suggestion, "to send out and discover the beginnings of the Bible," the expedition of George Smith to Assyria was set on foot, and he largely contributed in preparing it. It was also by his advice that the *Daily Telegraph* co-operated with the *New York Herald* in equipping Stanley for his work of exploration in Africa. In the field of more permanent literature he has accomplished much. He has written a drama entitled *Griselda*, a volume of poetry, and numerous translations from the Greek and the Sanskrit. He published an annotated copy of the *Hitopadeça* with a vocabulary in English, Sanskrit, and Mahrattí, a translation of the *Gita-Govinda* under the title *The Indian Song of Songs*, and a translation of the *Hitopadeça*, under the title *The Book of Good Counsels*. Between 1862 and 1864 he wrote a work on *The Education of India*, and another on *The History of the Administration of India under the late Marquis Dalhousie*. In 1878 appeared his poem, *The Light of Asia*, which presents the life and teaching of Gautama, the founder of Buddhism, as told by an Indian Buddhist. Its brilliant style and gorgeous imagery, as well as the elaboration of certain resemblances between the story of Gautama and the Gospels, gave this poem an immediate success. It was accepted by the king of Siam as "the most eloquent defence of Buddhism that has yet appeared." Mr.

Arnold's purpose, however, was simply to give to Europeans a favorable view of Buddhism as a religious system moulding the thoughts and lives of a large part of the human race. He has since published a volume of *Indian Poetry* (1881), containing translations from the *Mahâbhârata*, and *Pearls of the Faith* (1882). In the latter he essays to do for Mohammedanism what he has already done for Buddhism and Brahmanism. By presenting these systems in a guise more acceptable to Christians he hopes to promote greater sympathy and cordiality of feeling among the races of the British empire. He has received special honors from the king of Siam and the sultan of Turkey, and was appointed by Queen Victoria in 1877 a companion of the Star of India. Notwithstanding his arduous duties as editor of a daily newspaper and his studies of Oriental literature, he is fond of field-sports and open-air exercise. His wife is an American lady, a grand-niece of the theologian Dr. W. E. Channing. (H. C.)

ARNOLD, GOTTFRIED (1666–1714), a German author and Lutheran pastor, was the oldest son of a poor school-teacher of the same name in Annaberg, and was born Sept. 5, 1666. Through his father's poverty he was obliged to begin teaching in his thirteenth year, but he managed to complete his course of study in the gymnasium at Gera and the University of Wittenberg. From his youth he was predisposed to a zealous piety, which found little else than offence in the wild life of a German university of that time. He was a close student, but he always looked back on his university years as all but wasted. He came under the influence of Dr. Spener, the founder of the Pietist school in the Lutheran Church, and by Spener's recommendation he found a place successively in two wealthy Dresden families as a private tutor. He lost these by his frankness in rebuke, but accepted a third in Quedlinburg. In this city the Pietists were numerous, the pastor of the castle church, the deacon J. H. Sprögel, being one. Arnold, having given much time to studies in church history, and especially to that of the primitive Church, now published his *First Love, or, A True Portraiture of the Primitive Christians* (*Erste Liebe, oder wahre Abbildung der ersten Christen*), 1696; 5th ed. 1727; Dutch version by W. Sewell, 1700. This idealized picture of the early Church acquired a great popularity, and procured him a call to the chair of history in the University of Giessen, of which the Pietists, with the support of the Darmstadt court, had got complete control. He began his lectures in the autumn of 1697, and had good success as a teacher, but no satisfaction in his work, as it seemed "to crush the life of God in him." In the summer of 1698 he vacated his chair and returned to Quedlinburg, to become a resident in Sprögel's family and the teacher of his children. To explain this step he published a *Candid Confession* (*Offenherzige Bekenntniss*), 1698, which involved him in a war of pamphlets.

Arnold now devoted his leisure to the preparation of his *Impartial History of the Church and of the Heretics* (*Unpartheische Kirchen- und Ketzer-Historie*), 4 vols. folio, 1699–1700; 4 vols. 4to, 1729; 3 vols. folio, Schaffhausen (edited by Lic. Cremer and Prof. Cotta of Tübingen, 1742. This edition includes the attacks and defences of the history, besides the *Supplementa, Illustrationes et Emendationes*, published in 1703). The book began a new era. Heretofore, church history had been the humble handmaid of dogmatic systems. Arnold insisted on judging churches, sects, and parties not by their orthodoxy, but by their conformity to the Christian life. His own conception of that life was narrow and one-sided, yet his insistence on it began the emancipation of this science. He spared no one except the first Christians, who to him were still idealized characters. From the time of Constantine he saw worldliness and clerical pride dominant in every age of the Church, while the witnesses for the simplicity of the gospel were to be sought among the heretics. He thus introduced a fairer method of discussing the heretics. In his own century and that which preceded he found the divine succession of witnesses largely among the theosophers, mystics, pietists, and separatists. His last two volumes are a mine of information in regard to this class. The book was assailed on every side. Besides a great number of academic disputations, no less than fourteen writers published their censures on it, the most important being the two anti-Pietist theologians Cyprian and Loescher, the historian Pfanner, and the philosopher Leibnitz. In matters of detail it was easy enough to convict Arnold of errors, and he showed no reluctance in admitting these when proved. But as regards the whole book, it was an indictment which could be answered only by denunciations as "the worst book under heaven," while Christian Thomasius, the Halle jurist, pronounced it the best book of its kind and publicly commended it to his students. Spener refused even to read it, that he might not be forced to speak in condemnation of his friend.

The effect of these criticisms was to drive Arnold into a still more extreme position, and for a while he was ranked with the separatist followers of J. G. Gichtel, who rejected marriage and regarded Church and State alike as an organized Babel. In 1700 he published a work called *The Mystery of Divine Wisdom* (*Das Geheimniss der göttlichen Sophia*), in which these views were presented in prose and verse; and in the year following he edited Gichtel's *Theosophical Epistles*. But very soon we find traces of a return to a more conservative position, and a desire to come to terms with his former associates. This connects itself with his marriage with Sprögel's youngest daughter, Sept. 5, 1701, and his resumption of the work of preaching in the Lutheran pulpits. In August of that year he was called to Allstedt as chaplain to the duchess-dowager of Sachse-Eisenach. He accepted the call, but could not make good his place in the local church, as he refused to sign the symbolical books. His sovereign, now the king of Prussia, interceded for him with the ducal government, and even gave him the title of "royal historiographer" in order to secure him greater conside[illegible]tion. But it proved in vain, and the king in 1704 called him to Werben, in Brandenburg, where he succeeded his father-in-law as pastor and superintendent. In 1707 he undertook the same duties in Perleberg, near Potsdam. In these years Arnold gave himself wholly to successful pastoral work and ecclesiastical administration. His writings, which still were numerous, all bore the same character. His exhausting labors broke down his health, and the shock he received from the irruption of a press-gang into his church during the communion service proved too much for his weakened frame. He died May 30, 1714.

Of his more than forty publications, his *History* is the most valuable. Next in worth are his *History and Description of the Mystical Theology* (Latin, 1702; German, 1703 and 1738); his *Lives of the Primitive Fathers* (*Leben der Altvater*), 1700, 1718; his *Lives of the Faithful* (*Leben der Gläubigen*), 1701, 1732; and his *Married and Unmarried Life of the Primitive Christians* (*Eheliche und unverehelichte Leben der ersten Christen*), 1702, 1732. He wrote a considerable number of hymns, some of which appeared as appendices to his prose works, while others were published in a volume called *Sparkles of Divine Love* (*Göttliche Liebesfunken*), 1698. They have been collected by K. C. E. Ehmann; Arnold's *Geistliche Lieder*, Stuttgardt, 1856. Six of the best have been translated by Miss Winkworth.

Of biographies, the first is the *Gedoppelter Lebenslauf*, 1716, which includes a brief autobiography. Coler's *Historia Gothofredi Arnoldi* (Wittemberg, 1718) is a libel on his memory, and was answered by the Chiliast J. W. Petersen. In our times all other biographies have been superseded by that of Dr. Franz Dibelius (Berlin, 1873). (R. E. T.)

ARNOLD, ISAAC NEWTON, an American statesman and author, was born at Hartwick, Otsego co., N. Y., Nov. 30, 1815. He was educated at Hartwick

Academy, and admitted to the bar in 1835. Having removed to Chicago in 1836, in the following year, when that place was organized as a city, he was appointed city clerk. In 1842–43 he was a member of the Illinois legislature, and in 1844 was one of the presidential electors. He acted with the Democratic party until 1848, when he was a delegate to the Free-Soil convention at Buffalo which nominated Van Buren and Adams. In 1856 he was again elected to the State legislature, and was the Free-Soil candidate for Speaker. In 1860 he was elected to Congress as a Republican, and was chairman of the committee on the defence of the great lakes and rivers. He reported a bill for a ship-canal from Lake Michigan to the Mississippi, and took a prominent part in the convention which met at Chicago in June, 1863, to advocate this canal. The bill for this purpose passed the House of Representatives in Feb., 1865. Mr. Arnold introduced the bill prohibiting slavery in the Territories, and Feb. 15, 1864, he offered the first resolution ever adopted in Congress for the amendment of the U. S. Constitution so as entirely to abolish slavery. In 1865 he was appointed one of the auditors of the U. S. Treasury. In 1867 he published *The Life of Abraham Lincoln and the Overthrow of Slavery*, and in 1880 *The Life of Benedict Arnold*. In 1881 he read, by invitation, before the Royal Historical Society, London, a paper on "Abraham Lincoln." He has been for several years president of the Chicago Historical Society, and has published several pamphlets and addresses on subjects connected with the early history of Illinois.

ARNOLD, MATTHEW, the eldest son of Dr. Thomas Arnold, head-master of Rugby, an eminent critic, essayist, and poet, was born Dec. 24, 1822, at Laleham, near Staines, where his father then resided. His education, commenced at Winchester and Rugby, was completed in Balliol College, Oxford, of which he was elected scholar in 1840. He won the Newdegate prize for a poem on Cromwell in 1843; was graduated the following year, and became a fellow of Oriel College in 1845. Having been invited by Lord Lansdowne to become his private secretary, he was enabled to continue his linguistic and other studies and to cultivate the classic models of Greek verse. In 1851, after his marriage with a daughter of Justice Wightman, Lord Lansdowne procured for him the appointment of lay inspector of schools, a post congenial to his taste, and one whose functions led him deeply into an examination of the middle and higher systems of instruction on the Continent as well as throughout Great Britain, his contributions to the literature of education being among his most important and most practical essays. He holds this office at the present time, and has described himself as "for thirty years an inspector of schools." In 1857 he was elected professor of poetry at Oxford, and lectured from that chair for ten years. In 1869 the degree of doctor of laws was conferred on him by the University of Edinburgh, and in 1870 a similar honor was paid him by Oxford. While the duke of Genoa was studying in England he resided in the family of Matthew Arnold, and in acknowledgment of his friendship for the young man the king of Italy conferred upon him the order of commander of the Crown of Italy.

As a writer of prose and verse Mr. Arnold has been industrious and prolific. His published works are *A Strayed Reveller, and Other Poems* (1848); *Empedocles on Ætna, and Other Poems* (1853), withdrawn from circulation before fifty copies were sold, and reprinted in 1867 at the request of Robert Browning; *Merope*, a tragedy (1858); *On Translating Homer*, three lectures delivered at Oxford (1861); *Essays in Criticism* (1865); *Lectures on the Study of Celtic Literature* (1867); *New Poems* (1868); *Culture and Anarchy, an Essay in Political and Social Criticism* (1869); *Poems*, in two volumes (1869); *St. Paul and Protestantism* (1870); *Friendship's Garland, being the Conversations, Letters, and Opinions of the late Arminius, Baron von Thunder-Ten-Tronckh* (1871); *Literature and Dogma, an Essay toward the Better Apprehension of the Bible* (1873); *Higher Schools and Universities in Germany* (1874); *God and the Bible, a Review of the Objections to Literature and Dogma* (1876); *Last Essays on Church and Religion* (1877); *Mixed Essays* (1879); *Irish Essays* (1882). Dr. Arnold has edited *The Great Prophecy of Israel's Restoration* (*Isaiah, chapters xl.-lxvi.*), *arranged and edited for Young Learners* (1872); *Johnson's Chief Lives of the Poets, with a Preface* (1878); and *Letters, Speeches, and Tracts on Irish Affairs by Edmund Burke; collected and arranged*, with *a Preface* (1881). He appears frequently in the pages of the first periodicals as a writer on new aspects of politics and literature; and is recognized as the keenest, if not the most impartial, of purely literary critics. His style in prose is somewhat verbose and rhetorical; professing to be incapable of understanding metaphysics, he playfully derides those who employ metaphysical terms and reasoning in discussing religious and social questions, which he claims are altogether within the domain of simple language, common sense, and the apprehension of the common people. In replying to caustic criticism he has been pungent, and even drastic. As a controversialist he is courteous, polished, and acute. His mental method in approaching burning questions, is calm, liberal, and inclined towards democracy, but he has always asserted that in culture "the acquainting ourselves with the best that has been known and said in the world" is the remedy for the evils of misgovernment, ecclesiastical and social. So distinctly has the advocacy of this curative identified him in the public mind that he is commonly known as "the apostle of culture." He has rendered noble service to the advancement of honest debate in party politics in Great Britain, sparing the selfishness and hypocrisy of neither partisan organization, and leading the masses of the reading portion of the people into a candid and sincere way of looking at old institutions and contemplating new ones. His fondness for controversy has led him into occasional extravagance, a fault chiefly due to his preference for satire as a polemical weapon.

As a poet Mr. Arnold occupies a foremost place in the second rank, and has had neither model nor imitator. His early studies so charmed him with the Greek poetic art that his verse is essentially Greek in form; in feeling it is pantheistic, revealing the influence of Shelley and Wordsworth, while there runs through his later poems a vein of almost Christian reverence in which faith and doubt are inextricably mingled. Not a few of his poems betray only taste and learning; the spontaneity and fire of poetry are lacking. The fibre of his mind is essentially intellectual and argumentative; he is at his best, accordingly, in prose, while the energy and fecundity of his imagination have lent a poetic glow to even his polemical prose.

Mr. Arnold's theory of religion is in part original, in part eclectic. He substantially accepts the proposition of the material and moral evolutionists, adding to it a dash of pantheism for the beginnings of formal and ceremonial belief, without, however, committing himself to them unreservedly; he avoids connecting the investigations of physical science with religious idealism, and disclaims, with no little humor, the right to be considered a metaphysician or philosopher. The essence of his creed, if it may be so termed, is accessible in its paramount definitions, which are nowhere categorically arranged, but are scattered through his writings and frequently repeated in slightly varying phraseology. God is the "Eternal not-ourselves which makes for righteousness." Salvation "is a harmonious perfection only to be won by cultivating many sides in us." Culture, "acquaintance with the best that has been known and said in the world," is the only means of salvation; and in relation to the Bible, culture is "getting the power, through reading, to estimate the proportion and relation in what we read." The language of the Bible "is not scientific, rigid, and fixed, but fluid, passing, and literary." Those who interpret its phraseology as exact and literal are "wanting in intellectual seriousness." Nothing in religion is permanent which is not verifiable by experience, "for whatever is to stand must rest upon something verifiable, not unverifiable. Now, the assumption with which all the churches and sects set out, that there is a great personal First Cause, the moral and intelligent Governor of the universe, and that from him the Bible derives its authority, can never be verified." Christianity "is the greatest and happiest stroke ever yet made for human perfection;" "but at the present moment two things about the Christian religion must surely be clear to anybody with eyes in his head. One is, that men cannot do without it; the other, that they cannot do with it as it is." The first necessary step for its preservation is to frankly exclude from it the idea of preternaturalism; whatever in the Bible or in Christianity professes to be preternatural or miraculous was superimposed upon it by the boundless credulity and ignorance of man, and culture will inevitably and gradually expel it, leaving only that which is natural and true, because verifiable. "Religion is an enthusiasm for righteousness;" righteousness, controlling the appetites and the temper, conduces to happiness. For plastic art we go to the Greeks; they had a specialty for that, and give us an enthusiasm for it. For science we go to Aryan genius; the Aryans have a specialty for that, and give us an enthusiasm for it. But for righteousness we go to Israel and the Bible, because they have a specialty for righteousness, and give us an enthusiasm for it. But to acquire this enthusiasm it is essential that we interpret the Bible correctly.

The root of the difficulty lies, he thinks, in the ambiguity in the mode of employing the word "God." Instead of being the symbol of a definite and ascertainable idea, he maintains that it is a term of piety and eloquence, a literary term. The word "God," according to the philologists, means—like its kindred Aryan terms, Theos, Deus, Deva—brilliant. In the beginning men invoked the Brilliant on high as the power representing to them that which transcended the limits of their narrow selves, and that by which they lived and moved and had their being. "The not-ourselves which is in us and in the world around us has almost everywhere, as far as we can see, struck the minds of men as they awoke to consciousness, and has inspired them with awe. . . . Every one knows of what differences of operation men's dealing with this power has in different times and places shown itself capable—how here they have been moved by the not-ourselves to a cruel terror, there to a timid religiosity, there again to a play of imagination; almost always, however, connecting with it, by some string or other, conduct." At the time men were producing the documents which give to the Old Testament its power and true character, the not-ourselves which weighed upon the mind of Israel was that from which it obtained the sense of righteousness, the help to do right. This conception lay at the bottom of the change of their mode of naming God; this is what they intended by the term Jehovah, which we wrongly convey by "Jehovah" without translation, giving falsely the notion of a mere mythological deity, or, by a wrong translation, "Lord," "which gives us the notion of a magnified and non-natural man. The name they used was the Eternal." They had dwelt upon the thought of conduct and right and wrong till the not-ourselves which is in us and around us became to them as a power which makes for righteousness, "which makes for it unchangeably and eternally, and is therefore called The Eternal." This process, by which mankind came to recognize God as the Eternal which makes for righteousness, and a power which they called God, Mr. Arnold accepts as the true sense of "revelation." Man personified the Eternal, for he was strongly moved and an orator and poet, but he "did not scientifically predicate personality of God; he would not have had a notion what was meant by it." He confessed and extolled the Eternal which makes for righteousness out of gratitude; "the not-ourselves, which, by revealing to us righteousness, makes our happiness, adds to the boon this glorious world to be righteous in."

Gradually this conception of God underwent corruption. Hebrew prophets taught that righteousness must prevail, even against mighty empires—that Israel must recover its lost power through righteousness; but men's minds became obscured about the true meaning of restoration; mechanical notions of conduct began to prevail, and it came to be believed that the promises were made not to the righteous, but to the seed of Abraham. "Aberglaube," extra-belief, engendered the notion of a Messiah, a great personage who would fulfil the promises; and these Messianic ideas became the poetry of Hebrew life. The language of the Hebrew Scriptures about the Messiah is poetry. To take it literally shows "a want of intellectual seriousness." Christ, by the purity of his character, by the force of his teaching, and by his return to the essential truth of religion—that righteousness is happiness—came to be recognized as filling the measure of the promised Messiah. He succeeded where the prophets had failed by his new way of putting things. His new way is best described by ἐπιείκεια, "sweet reasonableness." He carefully distinguished between what was ceremony and what was conduct. By recommending, and in himself exemplifying, the two qualities by which our ordinary self is counteracted, he made his followers believe that in these qualities lay the secret of their best self, the qualities of self-renouncement and mildness; and that a man's happiness depends on attaining them. Christ taught that righteousness was inward; that was his "secret." He taught that the way to win the higher life was by self-renouncement; that was his "method." Mr. Arnold in all his religious writings lays great stress on the necessity of Christians returning to the "method" and the "secret." He accepts as accurate the statements that Christ identified himself with the description of the promised Messiah, departing here from that school of German and Dutch critics who assert that the Saviour never made such claims himself, but that they were made for him after his death by his enthusiastic or dishonest disciples. Mr. Arnold affirms that Christ made these pretensions sincerely, taking the words of the prophecies simply as poetry, and using them to bring his followers up to his standard of righteousness. He taught them to live according to the law of self-renouncement; he sought to lead them into right ways—into righteousness. God is the Eternal that makes for righteousness; therefore he might sincerely call himself the Son of God. As to miracles, Mr. Arnold attributes them to the credulity and ignorance of the people, not to any imposture on the part of Christ. He of course rejects the possibility of miracles altogether. Concerning the resurrection, he maintains that Christ used the words poetically and figuratively, meaning the triumph of the higher over the lower life, the victory of righteousness over unrighteousness. He concedes that St. Paul understood the phrase otherwise—that is, literally—and accounts for this intellectual blindness in a man of such piercing intellectual light by citing the belief of Sir Matthew Hale in witchcraft. It is impossible to know what in the New Testament is accurately ascribed to Jesus—what are the inventions and additions of his apostles and disciples, who were in awe of him, and whose superstition was inflamed by his personal superiority to them. By culture alone is the truth of the Bible to be ascertained. Nothing in it is true which cannot be verified. The Roman Catholic Church, he is disposed to believe, has possessed the "secret" of Christ; Protestantism has his "method." Each is deficient in what the other has. The Church of the future will be a modification of both, including what each possesses. This Church will be built gradually up by culture, for "the free-thinking of one age is the common sense of the next." The new Church will be one of sweetness and light, and to make sweetness and light prevail is the missionary function of culture. (M. F. S.)

ARNOLD, WILLIAM DELAFIELD (1828–1859), a son of Dr. Thomas Arnold of Rugby, was born April 7, 1828. He was educated in his father's school at Rugby, and entered Christ Church, Oxford, in 1846. In 1848 he joined the Indian army, which he quitted on account of ill-health in 1855, and then became director of public education in the Punjab. He published a small volume of lectures on English history, and a translation of the first series of Dr. L. Wiese's *German Letters on English Education* (1854). His only novel, *Oakfield, or Fellowship in the East*, is an exposition of the trials of a young officer who endeavors to set an example of fidelity to Christian principles amidst the vices and temptations of the army. He died at Gibraltar on his passage homeward, in April, 1859.

ARNOT, a mining-town in Tioga co., Pa., is on the Elmira and State-Line Railroad, 34 miles N. of Williamsport. It has a hotel, six churches, and three schools. It has saw-, grist-, and shingle-mills, but the chief occupations are mining coal and making coke. There are in the town 200 coke-ovens and two coal-crushers. It was settled in 1865, and in 1866 the railroad was extended from Blossburg to Arnot, 4 miles. Population, 2783.

ARNOT, WILLIAM (1806–1875), a Scotch clergyman, was born of poor parents at Scone, Nov. 11, 1806. At the age of sixteen he was apprenticed to a gardener, but he improved his scanty opportunities for learning, and determined to study for the ministry. He entered the University of Glasgow in 1829, graduated in due course, and was licensed to preach in 1837. He was at first assistant minister in Larbert, but in Nov., 1839, was called to St. Peter's Church, then newly formed in Glasgow, and in the January following entered upon his duties there. He took a warm interest in the movement which led to the formation of the Free Church of Scotland, and with his whole congregation left the Establishment in 1844. He was soon after sent as a commissioner to Canada in the interests of the Free Church, and spent some months there, chiefly in Montreal. Returning to his congregation in Glasgow, he was especially active in Sabbath-school work, and prepared some little books in furtherance of it. He also encouraged the temperance movement, and assisted in preparing an illustrated publication called *The Drunkard's Progress* (1852). By a decision of the House of Lords in 1849 his congregation had been ejected from the church-building they had continued to occupy since the Disruption, but a new church was speedily built. His interest in the religious movements on the continent of Europe was shown by his attendance at the meeting of the Evangelical Alliance at Berlin in Sept., 1857, and in many subsequent visits to France and Germany. In 1863 he accepted a call to the Free High Church, Edinburgh, of which he remained pastor till his death. In 1870 he was appointed, in company with Rev. Dr. W. G. Blaikie, as commissioner to bear the fraternal greetings of the Free Church of Scotland to the General Assembly of the Presbyterian Church of the United States, which met in Philadelphia. He visited America again in 1873, to attend the meeting of the Evangelical Alliance at New York. On both of these occasions he travelled extensively through the country, and preached in many of the large cities. Besides abundant pastoral labors, he delivered many lectures and addresses in various parts of Great Britain, engaged in religious work on the continent of Europe, and from the beginning of 1871 he was editor of the *Family Treasury*, for which he had previously written many articles. In the spring of 1875 his strength began to fail, and arrangements had been made for employing an assistant in pastoral work, when he died at Edinburgh, June 3, 1875. His principal publications were—a *Memoir of Rev. James Halley* (1842); *The Race for Riches* (1851); *Laws from Heaven for Life on Earth; Illustrations of the Book of Proverbs* (1852–57); *Roots and Fruits of the Christian Life* (1858); *The Parables of our Lord* (1864); *The Church in the House, or Lessons from the Acts* (1873); *Memoir of Rev. Dr. James Hamilton* (1869).

ARPAD, the Magyar national hero, founder of the kingdom of Hungary. He was a chief of the Magyars, who about 890 A. D. migrated from Galicia and conquered the Slavonic population of Croatia, Hungary, and Transylvania. He died in 907, and was succeeded by his son Zoltán. Andrew III., who died in 1301, was the last king of the Arpád dynasty.

See Vol. II. p. 549 Am. ed. (p. 628 Edin. ed.).

ARRAIGNMENT, in criminal law, is the calling of the prisoner to the bar of the court to answer the charge contained in the indictment. After the prisoner had been brought into court he was always, in former times, called by name to the bar of the court, and then required to hold up his hand in order to establish his identity. In case he refused to hold up his hand, identification in other ways was sufficient. The indictment was then read to him, and he was asked whether he was guilty or not guilty; and his answer was entered of record among the proceedings in the case. If he refused to answer and stood mute, he was subject to the terrible penalty of the *peine forte et dure*.

The subject of arraignment has been largely regulated by statute in America, and the formality is not now by any means universally necessary. Its omission, however, where required, is fatal to the proceedings, and a judgment of conviction will in such a case be set aside by the appellate court. (W. M. M.)

ARREBO, ANDERS CHRISTENSEN (1587–1637), a Danish poet, was born in 1587, and became bishop of Throndhjem when only thirty-one years old. He is usually styled the "father of Danish poetry"—an appellation he well deserves, as he was the first poet who used the Danish language successfully in metrical compositions. His most important work is his *Hexaëmeron* (1661), for which the French poet Du Bartas' poem on the Creation doubtless served as model; still, it is in many respects thoroughly original, and contains many spirited descriptions of Nature. Among his older works we note his metrical translation of the Psalms of David. He died in 1637.

ARREST, HEINRICH LUDWIG D' (1822–1875), a German astronomer, was born in Berlin, Aug. 13, 1822, and studied under Encke. In 1844 he discovered a comet, and made other similar discoveries in 1845, 1851, and 1857. In 1846 he became assistant at the Berlin Observatory, and in 1848 he removed to Leipsic, where in 1851 he published his work *Ueber das System der kleinen Planeten zwischen Mars und Jupiter*. In 1857 he was called as professor of astronomy to the Copenhagen University, where a new observatory was built under his direction in 1861. Besides several comets, D'Arrest discovered one planet, Freia; but the most of his time was devoted to observations of the nebulæ, and he was the first to discover a variable nebular spot. He published countless articles in the leading astronomical journals, and an important work on the nebulæ entitled *Siderum nebulosorum Observationes Hafnienses* (1867), which contains 4800 positions and 1942 nebulous spots, among which are 400 objects discovered by himself. He died suddenly, June 14, 1875.

See Vol. II. p. 552 Am. ed. (p. 632 Edin. ed.).

ARSENALS IN THE UNITED STATES. In June, 1776, the Continental Congress appointed a committee of five of its members, to be known as "the Board of War and Ordnance;" and in the following year this was superseded by a "Board of War," of three persons not members of Congress. Included in the duties of the latter were the building and management of arsenals. In 1778, by an act of Congress, many details regarding arms and ammunition were placed in the care of the commissary-general of military supplies, responsible to the Board of War. Armories were established during the Revolution at Springfield, Mass., and Carlisle, Pa., both on a small scale. In 1794, Congress passed an act providing for the erection of three or four arsenals, with magazines, etc. At this time the armory at Springfield—the only one in operation—employed about 150 men, and was able to turn out seventeen stand of arms daily. Cannon-foundries in Maryland and Rhode Island furnished 12-, 24-, and 32-pounders, mostly for coast defence. The armory at Harper's Ferry, Va., was established in 1795 (under the act of 1794). In 1806 a committee of Congress reported that there were in the magazines of the United States about 120,000 firearms and rifles fit for use, and 12,000 that needed repairs. An increased production in the armories was recommended. The ordnance department was first established by act of Congress May 14, 1812. It had at the head a commissary-general of ordnance, and on taking the office (in 1812) Col. Wadsworth addressed a series of letters to the Secretary of War, showing what was then needed for the improvement of the various depositories of arms. (See *U. S. Ordnance Reports.*) The two national armories, at Springfield and Harper's Ferry, were each under the direction of a civil superintendent. Arms, and especially ordnance, were still made for the Government outside of these armories, and Col. Wadsworth particularly compliments Eli Whitney, declaring that "it is not too much to say that the manufacture of arms is more indebted to him than to any other individual in this country." At the close of the War of 1812, though the military establishment was reduced to a peace-footing, the ordnance department was retained, with an organization similar to that which it had during the war. By the act of 1815 the armories and arsenals were placed under the control of a "colonel of ordnance," under the supervision of the Secretary of War. Col. Wadsworth filled this place, and he at once recommended the division of the country into military districts, each of which should be provided with an arsenal. His suggestions were followed in part. In addition to the two armories already mentioned, the ordnance department at that time (1815) controlled the sites of the following arsenals: Allegheny, Baton Rouge, Rome, Washington, and Watervliet. The sites of Bellona Arsenal, near Richmond, Va.; Frankford Arsenal, near Philadelphia; Pikesville Arsenal, near Baltimore; Watertown Arsenal, near Boston; Champlain Arsenal, Vergennes, Vt.; Augusta Arsenal, Ga.; and of the rifle-factory at Harper's Ferry, were purchased between the years 1815 and 1818. Specific sums were not appropriated for the arsenals till the year 1818. In accordance with the act of 1816, the ordnance department was continued as organized under the act of 1815, and it was placed on a footing with the engineer department so far as assignments to duty with the staff of the army were concerned. When the military peace establishment was reduced in 1821, provision for the ordnance department was made by the retention of a supernumerary captain of artillery to each of the artillery regiments, who was to be permanently assigned to ordnance duty. As there were but four regiments of artillery, the four captains were allowed the assistance of such additional officers of artillery as might be necessary to perform ordnance duties, the entire number of enlisted men in the department being reduced to 56. This plan of making periodical details of artillery officers for duty at the various ordnance stations was tried during the eleven years that followed 1821; but, finally, there was a general demand for a return to the separate organization. By an act of Congress, in 1832 the ordnance department was revived, and placed upon the footing that it has occupied down to the present time, with inconsiderable modifications. The official force under the first operation of the law consisted of 1 colonel, 2 majors, 10 captains, and a detail of as many lieutenants of artillery as might be necessary, the average number being 15 between the years 1832 and 1838. The number of enlisted men was increased to 250. It was provided in the Army Regulations of 1836 that the senior officer of the ordnance department should be stationed at Washington; that under the direction of the Secretary of War he should be charged with the superintendence and administration of the department; that under the direction of the Secretary of War as many arsenals of construction should be established as the public service might require; and that such arsenals should be under the immediate command and direction of the officers of the ordnance department. In 1838 the official force of the department was increased; and it was still further increased during the War with Mexico. In this shape it remained till the exigencies of the Civil War made imperative the act of 1861, which increased the strength of the department by the addition of 1 chief of ordnance (with the rank, etc. of brigadier-general), 1 lieutenant-colonel, and 6 lieutenants. Again, in 1863 the following were added: 1 lieutenant-colonel, 2 majors, 8 captains, and 8 first lieutenants. In 1863 the average number of enlisted men in the department was 500, and the average of hired workmen employed was 8000; in 1864 the numbers were 600 and 9000 respectively. When the Civil War closed the act of 1866 relative to the peace establishment fixed the grades of the officers of the ordnance department as follows: 1 brigadier-general, 3 colonels, 4 lieutenant-colonels, 10 majors, 20 captains, 16 first lieutenants, 10 second lieutenants, and 13 military storekeepers. An act of 1869 prohibited any new appointments or promotions in the department; consequently, the ten or twelve vacancies now existing have not been filled. As at present (1883) constituted, the duties of the ordnance department, under the direction of the Secretary of War, consist in providing, preserving, distributing, and accounting for every description of artillery, small-arms, and all the munitions of war which may be required for the fortresses of the country, the armies in the field, and for the whole body of the militia of the Union. Among these duties is comprised that of determining, subject to the approval of the Secretary of War, the general principles of construction, and of prescribing in detail the models and forms, of all military weapons employed in war. A further duty is that of prescribing the regulations for the proof and inspection of all such weapons, and of maintaining uniformity and economy in their fabrication. It is also prescribed that they shall ensure the good quality of such weapons, and that they shall preserve them faithfully and distribute them with the greatest care and accountability to the Government. For carrying into effect the general purposes here stated large annual appropriations are made, under which extensive operations are conducted at the national armory, arsenals, and ordnance dépôts. The officers of the department subordinate to the chief of ordnance are assigned to staff or other duty with the army, or to the command of arsenals, the armory, or other necessary duties connected with the ordnance department, under the control of the Secretary of War. In addition to the two national armories and the eleven arsenals that have been mentioned above as being in existence on the sites prepared in 1815, thirteen arsenals were built between this date and the year 1860. These new arsenals were the following: Charleston, S. C.; Detroit, at Dearbornville, Mich.; Fortress Monroe, at Old Point Comfort, Va.; Kennebec, at Augusta, Me.; New York, on Governor's Island; Mount Vernon, near Mount Vernon, Ala.; St. Louis, at St. Louis, Mo.; Appalachicola, at Chattahoochee, Fla.; Fayetteville, at Fayetteville, N. C.; Little Rock, at Little Rock, Ark.; San Antonio, at San Antonio, Texas; Fort Union, at Fort Union, N. M.; and Fort Leavenworth, at Fort Leavenworth, Kan. There were thus twenty-four U. S. arsenals and two armories at the breaking out of the rebellion in April, 1861. The value of this property was then estimated at $21,670,022.19. During the Rebellion armories were erected at Columbus, Ohio, Indianapolis, Ind., and Rock Island, Ill. The armory at Harper's Ferry was destroyed in 1861.

Besides the arsenal attached to the Springfield armory, there are now (1883) sixteen arsenals under the control of the ordnance department, the total value of this property being estimated at $52,535,354.19. The Carlisle Arsenal, established at Carlisle, Pa., in 1777, was chiefly a dépôt for ordnance stores, and the Schuylkill Arsenal, established at Philadelphia in 1800, was a mere laboratory. The same may be said of the so-called arsenals at Newport, Ky., and Memphis, Tenn. The principal details of all the other arsenals of the U. S. are given in the following table, those now in operation being distinguished by the *italic* type:

Official name.	Location.	Date of estab.	No. of builds.	Present condition.	Character of the work—Remarks.
Allegheny	Pittsburg, Pa	1814	44	In operation	Arsenal of construction.
Appalachicola	Chattahoochee, Fla.	1833	...	Discontinued in 1861	Depository and dépôt.
Augusta	Augusta, Ga.	1826	22	In operation	" " " also arsenal for repairs.
Baton Rouge	Baton Rouge, La	1826	...	Discontinued in 1869	" " " do. do.
Bellona	Near Richmond, Va	1815	...	Sold in 1856	Foundry and arsenal for repairs.
Benicia	Benicia, Cal.	1851	...	In operation	Arsenal of construction.
Champlain	Vergennes, Vt	1816	...	Sold in 1873	Depository and dépôt.
Charleston	Charleston, S. C.	1841	...	Made barracks in 1875	" " "
Columbus	Columbus, Ohio	1863	...	Leased as a school for orphans.	" " "
Detroit	Dearbornville, Mich	1832	...	Sold in 1875	" " "
Frankford	Philadelphia, Pa.	1816	35	In operation	Small-arms ammunition; also arsenal of construction.
Harper's Ferry	Harper's Ferry, W. Va	1796	...	Destroyed in 1861	Also an armory for the manufacture of small-arms.
Indianapolis	Indianapolis, Ind.	1863	10	In operation	Depository and dépôt.
Kennebec	Augusta, Me	1827	23	" "	Depository and arsenal for repairs.
Leavenworth	Leavenworth, Kan	1847	...	Made military prison in 1874.	" " " " "
Liberty	On Missouri River, Mo.	1836	...	Discontinued in 1847.	Depository and dépôt.
Little Rock	Little Rock, Ark	1837	...	Made barracks in 1873	" " "
Monroe	Old Point Comfort, Va.	1838	24	In operation	An arsenal-fort; sea-coast carriages; an arsenal of construction.
Mount Vernon	Mt. Vernon, Ala.	1829	...	Made barracks in 1873	Depository and dépôt.
New York	Governor's Island.	1836	16	In operation	" " "
North Carolina	Fayetteville, N. C.	1836	...	Sold in 1873	" " "
Pikesville	Pikesville, Md	1819	11	In operation	" " "
Rock Island	Rock Island, Ill.	1863	...	" "	Arsenal of construction; armory; powder-works; foundry.
Rome	Rome, N. Y.	1816	...	Sold in 1873.	Depository and dépôt.
San Antonio	San Antonio, Texas	1855	...	In operation	Depository and arsenal for repairs.
Springfield	Springfield, Mass.	1794	52	" "	Attached to the U. S. armory for the manufacture of rifles, carbines, and other small-arms.
St. Louis	St. Louis, Mo.	1827	...	Barracks, 1873; dépôt, 1879.	Arsenal of construction.
Union	Fort Union, N. M.	1860	...	In operation	An arsenal-fort; depository and arsenal for repairs.
Vancouver	Fort Vancouver, Wash. Ter.	1859	...	" "	Depository and arsenal for repairs.
Washington	Washington, D. C.	1816	37	" "	Arsenal of construction.
Watervliet	West Troy, N. Y	1814	35	" "	" " field-carriages, leather furnishings.
Watertown	Watertown, Mass.	1816	24	" "	Sea-coast carriages and projectiles for heavy guns.

The uses of the Washington Arsenal, at the seat of government, are apparent. The Watertown Arsenal acts as a distributing dépôt for Boston and the coast of New England south of Maine. The Watervliet Arsenal supplies a wide extent of territory by reason of its situation near the junction of the Erie Canal and the Hudson River. The Rock Island Arsenal, intended for the supply of the upper Mississippi and its tributaries, is the most completely equipped of all the arsenals in the United States. It is, in reality, the arsenal which was authorized by Congress in 1825 to be established on the Western waters. Chicago, Jeffersonville, Columbus, and many other places were applicants for this arsenal, but Rock Island carried away the prize during the Rebellion. The Rock Island Arsenal combines in one not only the arsenal proper, but also an armory, foundry, and powder-works. It will long be remembered for the two remarkable inventions there perfected by Col. Rodman, the commander —viz., the perforated cake or "prism" powder for heavy ordnance, and the casting of cannon with a core so cooled that the process of cooling the molten mass commences from the inner side, thus giving a harder and more close-grained metal for the surface of the bore, which thereby offers better resistance to the erosion of gas and to the friction of projectiles.

The early authorities who controlled the location of the arsenals that were built from time to time remained steadfast to these military maxims: That an arsenal should never be placed in an exposed situation, or in a fortified place except when absolutely necessary; that the location of arsenals throughout the country should be determined by the theory that in time of war the country would be divided into military districts forming separate and independent commands; that no exposed fort on the sea-coast should contain more stores than were necessary for its own defence; and that arsenals are not fit places for the employment of invalid soldiers or for the stationing of troops of the line. Of course in the establishment of arsenals regard was had to the expansion of a growing country; but after a time many of the arsenals became useless, not merely because the country had grown beyond its old limits, but also because the means of land- and water-transit had materially increased. Better facilities for transportation had the effect of rendering a number of the arsenals mere duplicates of others more fortunately situated. The arsenal at Rome, N. Y., for instance, was of no use when the Erie Canal gave access to all of Western New York from the Watervliet Arsenal. Consequently, the Rome Arsenal was abandoned, as was also the Vergennes Arsenal when the Champlain Canal allowed the Watervliet Arsenal to supply the Lake Champlain region. Railroads have done even more than canals in making certain of the arsenals useless, and the abandonment of such establishments is only a matter of time. The reports of the ordnance department for the past thirty years are full of recommendations for the abandonment of the useless arsenals. The plan just before the Rebellion was to concentrate all the work into four principal arsenals of construction—one in the Northern Atlantic States, one in the Southern Atlantic States, one in the Mississippi Valley, and one on the Pacific slope. Had this plan been carried out, the three arsenals selected would have been Watervliet, Fayetteville, and Benicia, with one to be constructed in the Mississippi Valley. The latest reports of the ordnance department recommend the establishment of a grand arsenal of construction in the vicinity of New York City, to be modelled after the one at Rock Island. With the development of the arsenal at Benicia there would then be but three grand arsenals of construction—one for the Atlantic coast, one for the Pacific coast, and one for the Mississippi Valley. All the remaining arsenals now in existence would be used simply as storehouses, or would be abandoned altogether. Such radical changes, however, are not likely to be adopted in haste by the War Department. The national armory at Springfield was the main dependence of the United States for small-arms during the Rebellion. Its capacity was increased to a product of 1000 muskets per day, and as many more were manufactured in other places under the supervision of United States officials. There were about twenty-five of these private armories under the control of the Government between the years 1861 and 1865.

Nearly every State in the Union has at least one arsenal or armory for the use of its own militia. The State of New York has fourteen armories, located as follows: New York, Newburg, Kingston, Albany, Troy, Utica, Schenectady, Oswego, Syracuse, Auburn, Watertown, Rochester, Buffalo, and Binghamton. Many of the larger cities have municipal armories. The State or city armories or arsenals are in no instance arsenals of construction; they merely serve as supply-dépôts, much of the supplies, ammunition, ordnance, and small-arms, being furnished by the various United States arsenals at the expense of the States and cities that send in orders. (F. G. M.)

ARSINOE, the name of several women who figure, without special prominence, in the legends of the Greek heroic cycle. In later times it was borne by many of the princesses of the Greek dynasty in Egypt, the mother of Ptolemy I., the founder of the line, having been named Arsinoe. Ptolemy's daughter Arsinoe was for a time (300–281 B.C.) the wife of Lysimachus, king of Thrace, and was afterwards married to her own brother, Ptolemy II., Philadelphus, whose first wife (also named Arsinoe) was a daughter of Lysimachus and mother of Ptolemy III., Euergetes. Another Arsinoe was the daughter of Ptolemy Euergetes and sister and queen of Ptolemy Philopator. She was the mother of Ptolemy Epiphanes (200–181 B.C.). Still another Arsinoe was a sister of the celebrated Cleopatra, and was put to death by Antony in 41 B.C.

ARSINOE was also, in the Ptolemaic and later times, the name of many ancient towns, of which the two most noted were in Egypt. The first in importance was more anciently called Crocodilopolis, and took its later name from Arsinoe, queen of Ptolemy Philadelphus. It is at present represented by the town of Medinet-el-Fayoom. This was one of the few places in ancient Egypt—Memphis being another—where Sebek, the crocodile-god, was worshipped. The other Arsinoe was on the Red Sea, near where Suez now stands.

See Vol. II. p. 556 Am. ed. (p. 635 Edin. ed.).

ARSON is the malicious and wilful burning of the house or outhouse of another man. It is not arson merely to burn one's own house, but if one's own house be in close proximity to the house of another, and if it would be a natural and likely consequence that the fire would communicate to the second house, and if it does actually so communicate, this will be arson. All outbuildings—barns, stables, dairies, and the like—are considered as outhouses, but buildings at a distance from the dwelling-house, and without connection therewith, fall without the rule. Burning a prison is ordinarily arson, though it is not arson for a prisoner merely to burn a hole in his cell through which he can escape, where his intent does not extend further. If the building burned be a dwelling-house, it is not essential that it be actually inhabited at the time of the burning. It is not necessary that there should be any actual blaze or that any portion of the building should be completely consumed; any burning whatever is sufficient to amount to the crime, though it is no more than charring; and the question whether or not there has been any burning is for the jury. If, however, the fire intended to communicate to the house go out of itself, or be subdued by the exertions of any one, before any actual burning of some part of the house has taken place, there has been no arson. The crime being rather against the possession than against the ownership, the occupier—and not the owner—of the house should be named in the indictment; and this appears to be so even if the occupier is wrongfully in possession.

Arson is a felony at common law, and was originally punishable by burning to death, but this was altered in Henry VII.'s time to death by hanging. The punishment for arson is now in England penal servitude for life or a term of years or whipping and imprisonment.

In America the punishment is generally fine and imprisonment, though in some of the States death is still the penalty where the crime is committed with certain features of aggravation. The whole subject has been very largely regulated by statute, and the difference between the details of the laws of the different States on the subject is very great, though the main principles of the common-law offence are generally adhered to, and still form the basis of interpretation for the statutory crime. Generally, it may be said that the head has been much enlarged, so that offences are included under it which would not have been otherwise, while the punishment is generally less severe than formerly. Thus, though it was not arson at common law to burn's one's own house, and though one could not be indicted for such burning where the intent was to defraud the insurers of the house, yet statutes have generally been passed to regulate this matter and to make such offences indictable. Again, the burning of personal property of various sorts has been made arson; as, *e. g.*, of wood and of various grains severed from the realty. An attempt to commit arson which fails has also been generally enacted to be an offence of a similar nature, though less severely punishable. The New York code and the codes of some other States create various degrees of the crime, making a difference between the crime when committed at night and in a house wherein there are human beings at the time—which is arson in the first degree and punishable by death in New York—and various artificial degrees, where the criminal intent appears less heinous. (W. M. M.)

See Vol. II. p. 557 Am. ed. (p. 639 Edin. ed.).

ARTA was one of the towns transferred in 1881 by Turkey to Greece, together with Thessaly and Southern Epirus, to which last district Arta belonged. It stands on the left bank of the river Arta, near the N. shore of the gulf of the same name, about 39° 8′ N. lat., 21° E. long. from Greenwich. It has considerable trade by sea, being one of the chief outlets for the products of Southern Albania. Its seaport, ten miles distant, is called Salagori. Arta is the see of a Greek archbishop of metropolitan rank, who has the title of exarch of all Ætolia. Near the town is a curious bridge, rising from low ground to a height at mid-stream of 100 feet. Population of town in 1882, 4990; of the district of Arta, 37,528. The river Arta for a considerable distance above its mouth forms a part of the new boundary between Turkey and Greece. (C. W. G.)

ARTAUD DE MONTOR, ALEXIS FRANÇOIS, CHEVALIER (1772–1849), a French author and diplomatist, was born at Paris in 1772. One of the *émigrés* of 1791, he was employed by the members of the royal family on certain embassies to the Holy See, and after 1802 became for a time the regularly accredited secretary of the French legation at Rome. He afterwards held similar positions at Florence and at Vienna. In 1830 he became a member of the Academy of Inscriptians, and from that time devoted himself entirely to letters. Among his works are *Considerations sur l'état de la peinture en Italie*, which relates to the centuries before Raphael; *Histoire de l'Italie; Machiavel, son génie et ses erreurs* (1833); *Voyage dans les Catacombes de Rome; Histoire des Souverains Pontifs;* and biographies of Hauterive and Pius VII. (the last being his most noted and by far his best work). He died Nov. 12, 1849.

See Vol. II. p. 563 Am. ed. (p. 644 Edin. ed.).

ARTESIAN WELLS. The term "artesian well" is generally applied to those deep perforations of small diameter from which water is ejected by hydrostatic pressure, but the more comprehensive use of the word includes any well from which a fluid, whether water, oil, or gas, is obtained, either by the pressure of the superincumbent fluid surrounding the well, or by producing a vacuum in pipes hermetically sealed and in which the fluid rises from atmospheric pressure transmitted through the surrounding earth.

The uses of the well-products are various. Aside from the pure water supplied for ordinary purposes, there are numerous saline and mineral waters for sanitary and medicinal purposes; the temperature of the deep-well waters is so high that they are frequently used for warming hospitals, conservatories, fish-ponds, and cress-plots; the volume of water is such as to furnish ample power for grist-, silk-, and other mills; the gas-supply is frequently conducted for many miles and utilized for generating steam in engines, for warming apartments, or for illuminating purposes; and the uses of the oil-supply are illimitable.

The existence of artesian wells dates from the earliest times of which any authentic records remain. The Chinese and Egyptians were largely dependent upon them for their supply of water. Numerous wells existed in Modena, Syria, and Libya, but it has been left for the present century to revive their general application to the arts and requirements of mankind.

The oldest well in existence in France is believed to be that of Artois at Lillers (Pas de Calais), dug in 1126 in a convent of Chartreux, which has been flowing constantly for upward of 750 years. The oldest recorded well in England was that at Nordland House, near London, sunk in 1794. It was the forerunner of the large number at present existing in the London basin.

The first engineer to sink wells in the Paris basin was M. Mulot, who was succeeded by MM. Dru, Laurent, Kind, and others, and strongly supported by M. Arago the philosopher. It was supposed that the supply would be independent of the diameter of the bore, and that the large diameter adopted by M. Kind for the shaft at Passy (of 1 m. = 3·28 feet) would be an extravagant failure. The result practically demonstrated the truth of his assertion, that the volume of water would increase directly with the area of the tube. Tours in France is largely supplied with water from artesian wells, and in Venice they have been introduced with much success.

The deepest well in the world is believed to be that at Sperenberg, 4194 feet through rock-salt, producing only brine. The deepest in the United States is that at the insane asylum at St. Louis, Mo., which is 3843½ feet, and produces saline water. It is not, however, a flowing well. Watson's, known as the "deep well," at Titusville, Pa., is a dry hole 3553 feet in length. Numerous other dry holes were drilled to depths varying from the above to 1600 feet. The oil-producing wells are all less than 2100 feet, the sands appearing to lie above sea-level. About 4000 well-shafts were sunk in the oil-fields of Pennsylvania in the year 1877, having an estimated total length of over 800 miles.

The uncertainty of obtaining a supply of fresh water is illustrated by the following experiences: In 1851 two wells were bored at Colchester, England, to supply the town, of about 20,000 inhabitants, with water. The first hole was sunk to a depth of 340 feet, when operations were suspended by the reduction of the diameter of the pipe to zero. The second well struck water at a depth of 353 feet, which has sufficed for the wants of the town ever since. The hole was lined throughout with wrought-iron pipes 8 inches in diameter, and perforated to a height of 20 feet from the bottom. At Harwich, 18 miles east of Colchester and on the coast, a similar bore sunk to a depth of 1098 feet failed to produce anything but salt water, which ebbed and flowed with the tide.

Systems of Boring.

The various methods of driving wells may be briefly sketched as follows:

1. The *Chinese;*
2. The *French*, or that of MM. Mulot and Laurent;
3. The *Saxon*, or that of M. Kind;
4. The water-jet system;
5. The American, as practised in the oil-regions;
6. The American driven well;
7. The Diamond Rock Drill Co.'s well.

1. The first is based upon the principle that the motion given to the tool in rotation was simply derived from the resistance that a rope would oppose to twisting. To this M. Fauvelle added the injection of a current of water through a central tube, which should wash out the detritus from the bottom. The difficulties attending the removal of the detritus by this method from great depths and large bores are so great as to cause it to be generally abandoned for deep wells, as the water required for the operation is often wanting.

2. In the second, which is the ordinary system of well-boring, the motion of the tools used for the drilling or removal of the rock is effected by means of solid iron or wooden rods connected with the machinery on the surface. The drill has a stroke of several feet. At great depths the rod is made hollow, and sometimes filled with cork to prevent vibrations.

3. The third method of driving differs from the above chiefly in the fact that its inventor, M. Kind, uses a "trepan" (cutting tool) of great weight and large diameter (that used at Passy weighed 1 ton 16 cwt. and had a diameter of 1 metre, or 3·28 feet), and makes his rods of oak in long lengths, which work in water, so they may be easily counterbalanced. The trepan was detached by the reaction of the water. This arrangement was subsequently modified by M. Dru, who changed the position and bearings of the clutch and method of detaching the tool, giving it a "free fall," so that it could be worked from six to eight days before removal, instead of, as formerly, from two to three. M. Dru applied this device at the large well of 47 inches diameter sunk at the Butte-aux-Cailles for the supply of the city of Paris.

4. Boring by means of hollow rods, with a continuous current of water, has been practised for some time. At the Vienna Exhibition a bore-hole was driven to a depth of 1206 feet in sixty-two days, but at that time (1873) the method was not applicable to loose ground where lining tubes are required, and was adapted only to holes of small diameter.

At Niederbardenberg two holes were sunk through strata overlying the Coal measures: the first penetrated to a depth of 460 feet in three working days; the second, to 540 feet in five days through a watery quicksand with a few strata of gravel and clay. The diameters were 4·33 inches and 4·72 inches at starting, diminishing to 2·16 at the bottom. The water, passing down through the hollow tube, rises outside of it and carries away the detritus, so that the rod is in fact floating in water. Should it become jammed, a smaller diameter is introduced after withdrawing or thrusting aside the cutter. It is *absolutely necessary* to keep up a continuous flow of water while boring, as otherwise the tube is likely to stick fast in the mud deposited: whenever, therefore, it becomes necessary to break connection with the pump, as in screwing on a new length of pipe, the boring must be stopped and water forced through the tube until it rises perfectly clear. From 8 to 13 gallons are required per minute. After the mud settles, about 90 per cent. of the water is pumped back and used again.

In 1873–74 the Copenhagen Company bored 72 holes by means of the water-jet, which varied from 23 to 558 feet in depth, or 9400 feet in 968 working days, giving an average of 9·7 feet per day, and costing about $2.50 per yard. Of these seventy-two wells, 18, or 28 per cent., were failures; 31, or 43 per cent., formed true artesian or flowing wells; while the re-

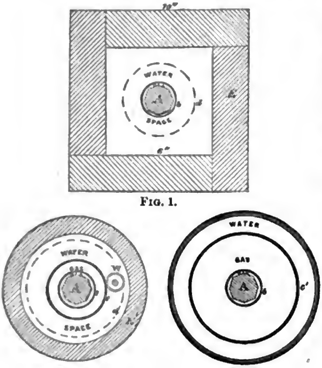


FIG. 1.

FIG. 2.

FIG. 3.

FIGS. 1, 2, 3.

maining 23 required pumping. At Kiel, 22 wells were bored by the same process, of which 14 are flowing, 5 require pumping, and 3 failed. The yield of existing wells is frequently reduced or entirely suspended by the tapping of the same supply by other wells of later construction. When boulders are encountered, a chamber is washed out by the water-jet, so that the obstruction, if small, can be thrust aside. If large, however, the tool is withdrawn and a dynamite cartridge lowered and exploded on the rock, which is then washed aside, as before, by the jet.

5. The American system of sinking deep wells is admirably illustrated in the reports of Mr. J. F. Carll and Dr. H. M. Chance on the oil-wells of Pennsylvania (*Report Second Geol. Survey*).

In 1861 it was customary to sink a square tube, 6 by 6 inches, of two-inch planks, from the surface through the drift to bed-rock. This is called the drive-pipe or surface section. From this point the diameter of the hole is reduced to 4 inches by a rapid bevel, and continues thus to the bottom. From the end of the drive-pipe section to that point in the strata where water ceases to enter, the bore is lined with 4-inch iron tubing, and a few feet of the space at bottom between this and the 2-inch conductor pipe, introduced after oil has been reached, is packed with what is known as the "seed-bag,"[1] to prevent the water in the superincumbent strata from interfering with the flow of oil. This is the "seed-bag section." The remaining depth to oil, constituting the "bottom section," is left open. (See fig. 1.)

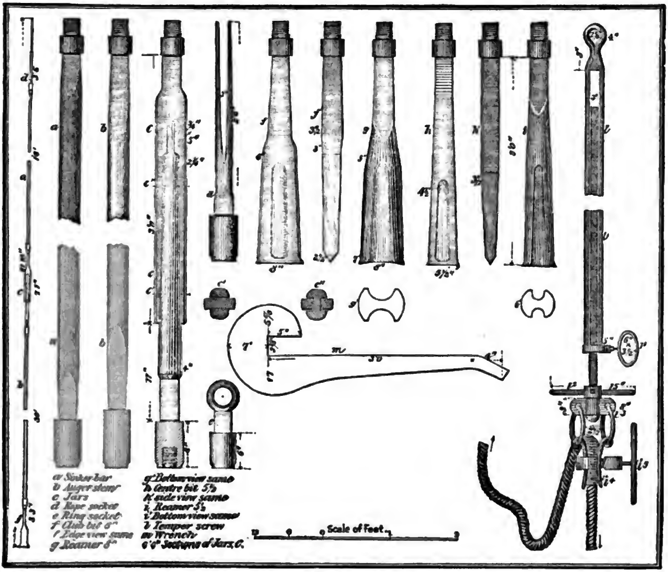


FIG. 4.

In 1868 the general arrangement was so far modified as to introduce discharge-pipes for gas and water as well as oil, so that in the drive-pipe section there was first the cast-iron drive-pipe, 6 inches inside diameter;

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[1] A leather collar tied on the outside of the pipe and filled with flaxseed.

next a wrought-iron casing, 3¼ inches diameter; then a wrought-iron tubing, 2 inches diameter; and finally the octagonal sucker-rod. Between the drive-pipe and casing there was inserted the ¾-inch pipe of the water-pump. At the bottom of the seed-bag section the casing terminated in a leather washer over the seed-bag, leaving an open mouth between the casing and tubing for the escape of gas, the bottom section remaining as formerly. By this arrangement the oil-pipe could be removed and repairs made without disturbing the seed-bag or letting water into the oil-bearing strata; which often proved disastrous. (See fig. 2.)

In 1878 the drive-pipe was enlarged to one of 8 inches diameter, armed with a steel shoe. Inside of this is placed the casing of 5⅝ inches diameter, which rests upon a bevelled shoulder at the bottom of the water-bearing strata, where the diameter of the hole is reduced from 8 to 5½ inches, thus dispensing with the seed-bag. The bottom section, 5½ inches diameter, is then continued as a dry hole until oil is reached or the well abandoned. (See fig. 3.)

The cost of drilling a well 1400 feet deep in 1866 by day's work was about $11,441, whilst in 1872 it was only about $6671 for 1402 feet of depth. The average cost for a 1500-foot well in 1880 was less than that of one of 500 feet in 1861. The rate varies from about $5 to $10 per lineal foot. In England the cost of boring is about $1.25 per foot for the first 10 feet, $12.50 for the next 40 feet, $26.25 for the next 60 feet, $68.75 for the next 100 feet, and so on in proportion.

The following table gives the location, depth, and cost of some French wells:

Place.	Department.	Feet.	Cost.
Grenelle,	Seine,	1798	$72,500
Donchery,	Ardennes,	1215	15,225
St. Fargeau,	Yonne,	666	6,060
Lille,	Nord,	592	1,600
Crosne,	Seine et Oise,	333	950
Brou,	Marne,	246	1,000
Ardes,	Nord,	155	320
Claye,	Seine et Marne,	108	390
Chaville,	Oise,	65	75

A "string of tools" (see fig. 4) consists of rope-socket *d*, sinker-bar *a*, jars *c*, auger-stem *b*, and bit *f*, weighing about 2100 pounds, having a total length of 62 feet 1 inch, and costing $417 for the 5½-inch diameter. The additional jars, bits, and reamer (*g*) for an 8-inch hole will increase the cost by $275, and the weight by 1890 pounds. The above-ground machinery embraces the engine, boiler, derrick, walking-beam, bull-wheel, temper-screw, and other details, including what is known as the "Carpenter's rig," which costs from $400 to $700, according to location, prices, etc.

Torpedoes.—A few words concerning the use of torpedoes in deep wells may not be out of place. As invented by Col. E. A. L. Roberts in 1862, they consisted at first of a simple tin canister filled with gunpowder, and having a percussion-cap placed at the upper end in such a manner that a slight blow would cause an explosion. Later, nitro-glycerine was substituted for gunpowder, and the charge was increased from 2 to 10 quarts to 30 to 60 quarts = 100 to 200 pounds. The shells or cartridges are sometimes over 20 feet long. The patent was applied for Nov., 1864, and on Jan. 21, 1865, the first test was made in Ladies' Well, on Watson Flats, near Titusville. After exploding two torpedoes, it commenced to flow oil and paraffine. In Dec., 1866, a torpedo was exploded in the Woodin Well, which was a dry hole, never having produced any oil. The explosion produced 20 barrels of oil per day, and a second experiment in January following raised the yield to 80 barrels. This established the reputation of the torpedo, and gave rise to numerous applications for patents and many interferences, in all of which, however, the validity of the Roberts patents was sustained. The effect of the torpedo may be compared to that of squeezing a sponge, as the oil-bearing rock is at first compressed violently, and a reservoir is left, in which the oil, relieved of pressure, rapidly accumulates.

6. *The American Driven Well.*—The difficulties and suffering caused by scarcity of water in some of the camps during the recent Civil War (1861–65) in America led Col. N. W. Green, of the Seventy-sixth regiment N. Y. volunteers, to invent and patent a method of obtaining water by means of a pipe driven into a water-bearing stratum. The first well was made in Oct., 1861, and the success of the experiment satisfied the most incredulous that the theory was sound. In consequence of several interferences and many bitter contests for this valuable invention, the patent was not issued to Col. Green until Jan. 14, 1868, and since that date many warmly-contested disputes have invariably terminated in his favor. The plant consists of an Andrews patent point, which is a tube of perforated metal protected internally by rings (see fig. 5) and shod with a sharp, wedged-shaped point for penetrating the earth. This point is coupled to a pipe by the ordinary sleeve-coupling, made so tight as to exclude the air. The upper end is connected with an ordinary pump, the sucker-rod of which may be long or short according to the depth at which water is found to stand in the tube. After the pipe has been driven to water, the pump is screwed on and the air exhausted. The water, thus relieved of its pressure, rises rapidly in the tube to a greater or lesser height, depending upon the degree of exhaustion, from whence it is readily lifted by the pump. By this simple device sufficient water can generally be obtained through a 1¼-inch pipe to supply all immediate wants at a very low cost and without any drilling or boring.

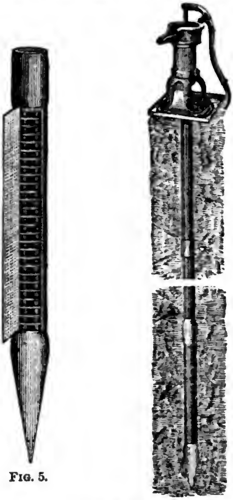

FIG. 5.

FIG. 6.

FIGS. 5, 6.

In England this well is known as the "Norton well," from the name of the agent, who has driven a large number of them both in Great Britain and on the Continent. They were found to be indispensable by the British armies during the invasion of Abyssinia. The driven wells at Alsopp & Sons' breweries, and those of Bass & Co. at Burton-upon-Trent, furnished 600,000 and 500,000 gallons per day, respectively, giving a combined yield sufficient for a city of 11,000 inhabitants.

A large number of these wells are in use in the United States for furnishing water for irrigation, stock-raising, brewing, paper-making, and domestic or municipal requirements. At Belleville, N. J., 30 such tubes have produced for over six months consecutively 2,750,000 gallons of water.

The general arrangement of a completed well and pump is shown in fig. 6.

A rapid and economical method of sinking deep holes is that practised by the Diamond Rock-Drill Company under the patent of M. Leschot. It consists of the use of a hollow tube or pipe (usually 2 inches in diameter), which carries at its lower end an annular bit (see fig. 7), in the edges and face of which are set some rough diamonds, technically known as *bort* (fig. 8). The rotation of the rod cuts out a cylindrical core, which may be broken up and removed by a water-jet, or taken out in sections by the core-lifter shown in fig. 9. The dust and powder produced by the bit are removed by a stream of water passing down the interior of the pipe and escaping around the cutting edge of the bit, thus serving to keep it cool. The pressure and feed are maintained by hydraulic cylinders acting upon a clamp on the drill-rod or by a worm. These machines enable holes to be bored at any angle in a horizontal or vertical plane, and of sizes varying from 1½ to 24 inches, this latter size having been used to extract a core from each of the 260 columns at the Illinois State Capitol building for the purpose of making them lighter. The diameter of the core was 22¾ inches. The reciprocating machines, actuated by gravity, must drill only vertically.

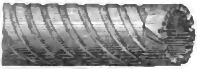
FIG. 7.

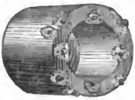
FIG. 8.

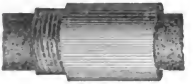
FIG. 9.

FIGS. 7, 8, 9.

The following tables contain valuable statistics relating to artesian wells:

Wells in and near London (from Mylne's *Section of London Strata*).

	Feet.		Feet.
Combe & Co's	522	In Essex:	
Excise Office, City	499	Foulness Island	450
Plummer, Old Street	475	Mersea and adj. isl'ds.	300
Meux & Co.'s brewery	425	Wallasea Island	400
Hampstead Water-works	450	Little Wigborough	250
North-western R. R. Sta.	400	Woodham	350
Elliott & Co.	398	North Ockendon	80
Kensington Union	370	Fobbing	100
Model Prison, Holloway	370	Bulpham Fen	70–80

Principal Artesian Wells in Europe.

Name or Location.	Depth, feet.	Diameter.	Year.	Capacity.	Remarks.
Lillers (Pas-de-Calais)			1126		In Artois, France.
Nordland House			1794		Near London, first in England.
Sion House, at Chiswick	620				In duke of Northumberland's grounds; water rose to 4 feet above the surface.
Horticultural Soc., at Chiswick	329				In the gardens; water rose to surface.
Hammersmith	360				
Fulham	384			50 gals. per m.	
"	317			60 " "	
Sheerness	300			Abundant	At mouth of Thames.
"	328				Water rose 8 feet above ground.
Merton, in Surrey				200 gals. per m.	
Southampton				10 "	Water rose to 5 feet above ground.
Bourne, Lincolnshire	95			347 "	
Brighton	97		1842	Over 700 "	By pumping.
Colchester	353		1851	Ample.	
Harwich	1098				Only brackish water obtained.
Croydon				700 gals. per m.	From two wells.
Tooting					Sufficient to turn a wheel.
Truman & Co.'s brewery, London.	400				Sunk from bottom of an old well 16 feet in diameter. The first section, of 11 feet diameter, was bricked in to 8 feet 6 inches. At 115 feet 3 inches a cast-iron cylinder was used; at 200 feet depth the diameter was reduced to 2 feet. The yield was 81 gals. per m., and cost $28,975.
Well of Mondorff	2388				In Luxembourg.
Donchery	1215				In the Ardennes.
Calais	1138				Cost $17,800.
Sugar-refinery of M. Say	1570	19 in.	1864–67		Built by M. Dru in 2¼ years.
La Chapelle, Paris	2960 ?	67 "			Begun Jan., 1866; 1811 feet completed Nov., 1869.
Butte-aux-Cailles	2600 to 2900	47 "			M. Dru.
St. Ouen					Through five water-bearing strata, two of which supply water from different levels to feed the fountain and canal basin.
St. Nicholas d'Allermont	1030				Passed through seven water-strata in seeking for coal; water rose to surface, but well was abandoned.
Roussillon					Water rises to 40 feet above surface.
Heilbronn, in Wurtemberg					Water used to heat a paper-manufactory.
Stuttgart and Alsace					Similar wells to the above.
Monastery of St. André, 2 miles from Aire, in Artois.					Well over 100 years old, supplies 45 gals. per min., rising to a height of 11 feet above ground.
At Bages, near Perpignan				330 gals. per m.	
Tours				237 " "	6 feet above ground, and runs a water-wheel 21 feet in diameter, for a silk factory.
Gonêhem, near Béthune	120				Four wells run a flour-mill.
Roubaix, near Arras					288 cubic yards per day; runs a silk-factory, dye-works, etc.
Fontès, near Aire					10 wells, run a large flour-mill, nail- and silk-factory.
Neusalwerk, near Minden	2288				Dug in 1858.
Béthune	100				
Passy (by M. Kind)	2000 nearly				150 feet masonry; 1804 feet tubing, and a perforated point; yields over 5,000,000 gals. per day, and cost about $200,000. Built Sept. 15, 1855, to Sept. 24, 1861.
Grenelle (by M. Mulot)	1797½				Completed Feb. 26, 1841, at a cost of about $72,500.

Important Wells in the United States.

St. Louis, Mo.: Belcher's sugar-refinery, commenced spring of 1849; at intervals to March, 1855; finished in 33 months' steady work; 75 gallons per minute; 2197 feet deep; cost $10,000; mineral, salty, strong odor of sulphur, and medicinal virtues; water can be carried 75 feet above surface.

St. Louis Insane Asylum (180 feet above the former): 3 years 5½ months from March 31, 1866; 3843·5 feet; last forty feet in granite, diameter 4½ inches from depth

of 1022 feet; water saline, but does not rise to surface.

Chicago: 700 to 1200 feet deep; discharge about 1,250,000 gallons, with a head of 125 feet above Lake Michigan.

Louisville, Ky.: 2086 feet; April, 1857, to July, 1858; plentiful supply; water mineral.

Columbus, O.: 2775½ feet; no water with head enough to reach surface; warm, 91°, and saline.

New York wells: less than 500 feet; give water to within 20 feet of surface. At Ehret's brewery four holes were bored in different directions, but converging at one point, giving a supply of 2000 gallons per hour.

Terre Haute, Ind.: several wells, 1600 to 1900 feet (one yields strong sulphur-water; two others petroleum).

Lake Charles, in Calcasieu parish, La.: mineral, from great sulphur-bed at depth of 440 feet; yield, 65 gallons per minute; rises to 12 feet above surface.

Charleston, S. C.: 1250 feet; begun in 1848; saline, soft water; 10 feet above surface; 20 gallons per minute.

New Orleans, La.: 630 feet; through quicksands; no satisfactory result.

Llano Estacado, Texas: under Pope, 1855; 800-900 feet; water rose within an available distance of surface.

Titusville, Pa., Watson's well: 3553 feet; dry hole.

Philadelphia, Continental Hotel: 8 inches diameter, 206 feet deep; 72,000 gallons per day.

Andover, Dak. T.: 1070 feet deep; 500 gallons per minute 100 feet above the ground; water very soft, pure and clear as crystal.

Pine Forest Shaft Colliery, Pa.: a *horizontal* hole was driven for 111 feet 4 inches through slate and conglomerate by the Diamond Drill Co., producing a supply of water to run a boiler for fans; in 1871.

Rondout, N. Y.: same company bored a 3-inch horizontal hole 450 feet long, giving an abundant supply.

Goderich, Ont.: a *prospecting*-hole was bored through numerous beds of drift, dolomite, marls, and rock-salt to a depth of 1517 feet by the Diamond Drill Co.

Empire Mine, Lackawanna Coal Co.: hole 375 feet deep, 9 inches diameter.

For the theory of artesian wells, and temperature of the waters produced by them, see the ENCYCLOPÆDIA BRITANNICA. For authorities, aside from those there mentioned, see *Proceedings Institution of Civil Engineers*, London; *U. S. Patent-Office Reports*; H. S. Drinker's *Tunnelling Explosive Compounds and Rock-Drills*; *Reports of Second Geological Survey of Pennsylvania*, vol. iii., on oil-regions; Ure's *Dictionary of Science and Arts*, etc. (L. M. H.)

ARTHUR, CHESTER ALAN, twenty-first President of the United States, was born at Fairfield, Vt., Oct. 5, 1830. His father, Rev. William Arthur, D.D., a native of the north of Ireland, having graduated at Belfast College, came to this country at the age of eighteen. He became a Baptist minister, and served as pastor of several congregations, chiefly in New York and Vermont. He also published a work on *Family Names*, and edited for some years a journal called *The Antiquarian*. He died at Newtonville, N. Y., Oct. 27, 1875. Chester was born in a log cabin which his father occupied while waiting for the erection of a parsonage. He was educated at Schenectady, N. Y., in an academy taught by James I. Lourie, and entered Union College in 1845. During part of his course he supported himself by teaching school, and after graduating in 1848 he still continued to teach while studying law at Lansingburg, N. Y., where his father then resided. Having saved $500 by strict economy, he went to New York City, and entered the law-office of Mr. E. D. Culver, a friend of his father. He was admitted to the bar in 1853, and became junior member of the firm of Culver, Parker & Arthur. This firm was then employed in the celebrated Lemmon case, in which it was decided by Judge Elijah Paine that a slave brought voluntarily by his master into New York became free. At the instance of the Virginia legislature an appeal was taken to the higher courts, and able lawyers employed to defend the right of slaveholders to their slave-property while passing through a free State. Mr. Arthur took a prominent part in the successful effort to induce the legislature of New York to engage eminent counsel to maintain the constitutionality of the laws of the State. The original decision was sustained, and henceforth it was established that no person could be held in bondage in New York except by the proviso in the National Constitution with reference to fugitives. Mr. Arthur's firm became the legal champions of colored people, and in 1856 were successful in enforcing their right to ride in the street-cars.

At this time the Republican party was formed in consequence of the passage of the Kansas-Nebraska bill throwing open the Territories to slavery. Mr. Arthur, who heretofore had been a Whig, was active in the local organization of the new party, participated in its struggles, and contributed to its success. In 1860, Gov. E. D. Morgan, being re-elected, appointed Mr. Arthur engineer-in-chief on his staff. The duties of this position had long been almost nominal, but the breaking out of the war rendered it important, and Mr. Arthur's experience in connection with the militia proved of great service. In April, 1861, Gov. Morgan requested him to open a branch quartermaster's department in New York City, and soon after gave him the entire charge of preparing and equipping the soldiers of the State. This task remained throughout the war in Gen. Arthur's hands, and was performed to the satisfaction of every one interested. As engineer-in-chief he made an elaborate report to the legislature in January, 1862, on the defence of New York harbor and of the inland border. Being appointed inspector-general in February, 1862, he visited the New York regiments in the Army of the Potomac, and saw that their wants were supplied. In June, 1862, he returned, and was secretary at the meeting of the loyal governors held in the Astor House, New York City. When in consequence of this meeting President Lincoln called for more troops, Gen. Arthur became quartermaster, and was efficient in raising the quota of his State, while by careful management the expenses were kept down. In December, 1863, Hon. Horatio Seymour became governor of New York, and Gen. Arthur returned to the practice of law in New York City. But he continued to be active in political affairs, was chairman of the Republican State executive committee of New York, and did much to promote the nomination and election of President Grant in 1868. He was appointed Nov. 20, 1871, to be collector of the port of New York, and when his first term expired in 1875, was renominated and unanimously confirmed by the Senate. During his tenure of this office the removals of employés were much fewer in number than had been customary, and improvements were introduced in the management.

In July, 1878, he was removed from his position by Secretary Sherman, and Mr. E. A. Merritt was appointed in his place. In 1879 he was elected chairman of the Republican State committee, and did much to secure the election of the candidates for State offices.

When, in June, 1880, at the Republican national convention held in Chicago, Gen. Garfield was nominated for President, it was considered necessary for the success of the party that the second nominee should be taken from New York, and the delegation from that State recommended Gen. Arthur, who was forthwith nominated. In November he was elected Vice-President, and in March, 1881, he took his place as presiding officer of the Senate. A contest soon began between two factions of the Republican party concerning the President's appointments to office, which culminated in the resignation of both the Senators from New York. Mr. Arthur strove to procure the re-election of Hon. Roscoe Conkling by the State legislature, but was not successful. While these seats were vacant the majority of the Senate was Democratic, and Mr. Arthur retained the chair till adjournment, preventing the customary election of a president *pro tempore*.

On July 2, 1881, Charles J. Guiteau, a vain, unprincipled man, enraged at the refusal of an office and influenced by the political excitement, shot President Garfield. During the eighty days that elapsed before the President's death Mr. Arthur remained in privacy, giving no countenance to the proposal made by some public men that he should assume the powers of the President during his disability from his wound. As soon as the death of the President was announced he took the oath of office privately in New York, Sept. 20, and proceeded to Washington, where his public inauguration took place Sept. 22. In his address he promised to carry out the policy of his predecessor. When the members of Mr. Garfield's Cabinet offered their resignations, they were requested to retain their places till the meeting of Congress in December. President Arthur called a special session of the Senate, which met Oct. 10, and confirmed several nominations, most of which had been made by President Garfield, though sent in by his successor.

ARTHUR, William, an Irish Wesleyan clergyman and author, was born in the county Antrim in 1819. The family to which he belongs is the same as that of Pres. Arthur of the United States, and the name was originally McArthur. It is retained in its older form by Alderman McArthur, lord mayor of London in 1881. William Arthur, after receiving a classical education, studied theology at Hoxton College, near London, and in 1839 went to India as a missionary. Three years later he was obliged to return on account of threatened loss of sight. He resided in France from 1846 to 1848, and was afterward chosen secretary of the Methodist Missionary Society and president of the British Conference. In 1867 he became president of the Methodist College at Belfast, but resigned that position in 1871. He has published a number of works, among which are—*A Mission to the Mysore* (1847); *The Successful Merchant, a Life of Samuel Budgett* (1852); *The Tongue of Fire, or True Power of Christianity* (1856); *Italy in Transition* (1860).

ARTICLES OF WAR. These may be defined to be the penal code by which two classes of persons are governed—namely, those actually in the military service of their country, either by commission as officers or by voluntary enlistment, conscription, or impressment as soldiers; and those voluntarily serving with an army in the field in other capacities, such as camp-followers, officers' private servants, sutlers, newspaper reporters, and the like.

By this code many acts are made military offences which could not be committed by civilians, such as sleeping on post, making a false muster, striking a superior officer, and desertion.

Many common-law crimes, if committed by persons subject to military jurisdiction, are also, by this code, cognizable before the tribunal designated by it for the ascertainment of the guilt of the offender. Such a code is not to be confounded with the "laws of war," which constitute that portion of the laws of nations applicable to belligerent operations on land, and embrace in their jurisdiction all non-combatants, as well as military persons, within the lines of the contending forces.

Articles of war are also distinct from army regulations, which are prescribed by the executive, and, although having the force of law while in existence, are merely administrative. If such regulations are violated, recourse must be had to the articles of war to ascertain whether an offence has been committed, and, if so, the method of procedure to bring the offender to trial and the measure of punishment.

All governments from the earliest times have found it necessary to provide some sort of code, however imperfect, for the government of their military forces. In some instances, as in the case of the Romans, civil crimes, when committed by persons in military service, were tried by the civil tribunals, and military crimes by military authority. In England, from the Conquest down to 1640, the "court of chivalry" or "marshal's court" was the only recognized legal tribunal for the trial of military offences in time of war. This court was presided over by the high constable, and the earl marshal was a member. After a time it assumed such extensive jurisdiction that in the 13th Rich. II. it became necessary to define its limits by statute, as follows: "To the constable it pertaineth to have cognizance of contracts touching deeds of arms and of war out of the realm, and also of things that touch war within the realm, which cannot be determined nor discussed by the common law, with other usages and customs to the same matter pertaining, which other constables heretofore have duly and reasonably used in their time." Subsequently, when there was no one in office as high constable, the earl marshal undertook to hold the court alone, but his jurisdiction having been questioned during the reign of James I., the privy council held that he could properly hold the court. In the reign of Charles I., however, the court of King's Bench ruled against the validity of the "court marshall" as thus constituted. There appears to have been no prescribed form of trial before this tribunal, and no limitations as to punishment. The sovereign of England, by virtue of his prerogative, could prescribe articles of war for the government of armies raised in time of war, whether such war was a foreign or domestic one. In time of peace, however, there was no legal distinction between the soldier and the citizen, and the common law gave the sovereign no power to control his troops by means of articles of war. Under the Plantagenets and Tudors there had been no regular standing army. That which was raised under the last kings of the house of Stuart was not recognized by Parliament. Consequently, when James II. desired to punish deserters under an obsolete statute of Henry VI., to which a forced construction had been given by corrupt and servile judges, the alleged offenders had to be tried at the assizes by a petit jury on an indictment found by a grand jury. When the Revolution of 1688 took place the Convention Parliament found an army on its hands to be disposed of. The prospect of immediate war with France made it inexpedient to disband these troops, which James II., in one of his latest acts before abdication, had undertaken to disband. The mutiny at Ipswich of the First regiment of foot, or Royal Scots, made it necessary to provide a mode of government other than by the common law for military persons in time of peace, and a "Mutiny Bill," which otherwise would not have passed without the greatest difficulty, was, on the 28th of March, 1689, enacted by Parliament without a division. It was limited in its duration to six months, and declared preliminarily, in explicit terms, that standing armies and courts-martial were unknown to the law of England. It was then enacted that, on account of the extreme perils then impending over the state, no man mustered on pay should, on pain of death or of such lighter punishment as a court-martial should deem sufficient, desert his colors or mutiny against his commanding officers. When the six months had expired the power necessary to the maintenance of military discipline was a second time entrusted to the Crown for a short term, and, the necessity continuing, not a session passed without a mutiny bill, with its declaratory preamble as to the law as laid down in the Declaration of Right. This practice has continued to the present time, except that as experience has shown a necessity therefor articles have, from time to time, been added or amended.

Gradually and almost imperceptibly the regular standing army has become one of the institutions of Great Britain, and has acted in such perfect harmony with all her other institutions that, in the language of Lord Macaulay, it has never once during a hundred and sixty years been untrue to the throne or disobedient to the law—has never once defied the tribunals or overawed the constituent bodies.

By the first mutiny bills desertion, mutiny, and sedition were the only acts made military crimes punishable by courts-martial, and if a soldier struck his officer the offence was only an assault and battery at common law. In 1717, Parliament first authorized the sovereign to put forth articles which should be in force within the realm in time of peace. The mutiny bill, by its reference to courts-martial, had recognized the description of tribunal which in time of war had administered justice to military offenders. In 1629, Charles I. had issued articles of war, but the tribunal for their enforcement was the marshal's court. In 1639, the earl of Arundel, earl marshal of England and lord general commanding the northern army, under warrant of his commission to hear, examine, and debate, himself *or by deputies*, all causes, both criminal and civil, arising within the army, promulgated articles of war, in which the administration of military justice was entrusted to "the councell of warre" or "court-marshall" and the advocate of the army, except where the lord general himself chose to act. This is the earliest instance of the institution in England of courts-martial. The idea seems to have been derived from the articles of war promulgated by Gustavus Adolphus of Sweden in 1620, and translated into English in 1639.

In the articles of war of the earl of Northumberland in 1640 the "council of warre" was also recognized. In 1642 the earl of Essex, under a parliamentary ordinance, issued articles of war, sometimes known as the "Parliamentary Articles," in which the same provision as to military tribunals was adopted; and in the following year the articles and ordinances published for the government of the army in Scotland recognized the "court of warre" or "martial court" as the tribunal for military offences.

In 1666, under Charles II., courts-martial were divided into three classes, which distinction is still to be found in the American army—namely: General courts-martial, to consist of thirteen officers, having jurisdiction of capital and the graver military offences and for the trial of officers; regimental courts-martial, for the trial of soldiers for minor offences; and detachment courts-martial, appointed by post or garrison commanders, with the same jurisdiction as regimental courts.

In 1686, James II. issued articles prescribing more particularly the composition of these tribunals.

During colonial times in North America, in the several wars in which England was engaged with France, a number of provincial regiments were raised "for the war," which were taken into the service of the Crown and governed by the articles of war. When the war of the American Revolution began by the affair at Lexington, April 19, 1775, and regiments of minute-men were ordered to the besieging camp around Boston, the provincial conventions found it necessary to govern their several contingents by a stricter penal code than the ordinary laws of the land. The Massachusetts provincial congress had on Feb. 10, 1775, appointed a committee to digest and prepare articles of war, which were thereupon adopted. As, however, the provincial army assembled before Boston came from different colonies, the Massachusetts provincial congress on May 16, 1775, requested the Continental Congress to take the regulation and general direction of the provincial forces there encamped. The latter legislative authority appointed a committee of five of its members, of which George Washington was chairman and Philip Schuyler a member, to prepare articles of war for the Continental army, which were adopted on June 30, 1775. These articles were almost identical with the British, but were in several particulars milder as to punishments. It soon, however, became evident that a code which was the outgrowth of experience could not thus be modified, and on Nov. 7, 1775, and again on Sept. 20, 1776, Congress had to make the articles more stringent in the amended portions. After the peace of 1783 a small military establishment was maintained by the Congress of the United States under the same articles. By the present Constitution of the United States, Congress is authorized to raise and support armies and to make rules for their government and regulation, and by the Fifth Amendment persons in the military service may be held to answer for a capital or otherwise infamous crime without a presentment or indictment of a grand jury. In 1806, Congress reenacted, with slight amendments, the articles of war which had governed the Continental army and militia when in actual service during the War of American Independence. During the War of the Rebellion (1861–65) some few additions were found necessary by Congress, and in 1874 the articles of war were codified as section 1342 of the Revised Statutes of the United States. They are the outgrowth of the matured experience of two hundred and fifty years, and constitute the statutory penal code for the government of the armies of the United States. Under these articles many acts are made military offences which either could not be committed by a civilian, or if so committed would not be criminal. Other acts which at common law would be but misdemeanors are by this code liable to be punished capitally. In time of war any felony committed by a person in the military service of the United States is made punishable by the sentence of a general court-martial. In time of peace, as decided by the Supreme Court of the United States in April, 1882, all crimes, not capital, to the prejudice of good order and military discipline, when committed by such a person, may, under the 62d article of war, be taken cognizance of by the proper description of court-martial, according to the nature and degree of the offence, and punished at the discretion of such court. This code also provides for the appointment in proper cases, and under suitable limitations, of courts of inquiry to examine into the nature of any transaction of, or accusation or imputation against, any officer or soldier. (A. B. G.)

ARTIODACTYLES, ungulate or hoofed mammals, with the hoofed digits (δάκτυλος, digit) in pairs (ἄρτιος, even in number), as in the common cattle, deer, camels, etc. The character alluded to in the name is the external expression of a number of anatomical modifications which separate the forms so combined widely from the other hoofed mammals—*i. e.*, the horse, rhinoceros, tapir, etc. The third and fourth digits of the typical number (five) are the enlarged paired hoofs, and in addition there may be smaller lateral digits, or such may be entirely wanting. The proximal carpal and tarsal bones are correspondingly modified, and the astragalus especially is notable for the division of its anterior or inferior articular surface into two subequal facets; the femur has a third trochanter, and its shaft is generally perforated at the fore and upper part by the medullary artery. The dorso-lumbar vertebræ are generally nineteen in number—viz., dorsal 12–15; lumbar, 7–4. The intermaxillary bones are more or less flattened toward the symphysis, and the incisors, when present, are wide apart at the roots, but converge towards their crowns. They are, however, often, or even in the majority of species, absent. The stomach is more or less subdivided and complex, and a comparatively small and simple cæcum is developed. The group thus distinguished is generally considered as a sub-order of the Ungulata and collateral with another sub-order, Perissodactyles, comprising the horse-like animals, rhinoceros, tapirs, etc.; but by some it is regarded as one of the orders of Mammals. It has been constituted for the ruminants (*Bovidæ*, *Cervidæ*, *Tragulidæ*, etc.), the hog-like forms (*Hippopotamidæ*, *Suidæ*, *Dicotylidæ*, etc.), and the camels (*Camelidæ*), and has a number of extinct representatives which bridge over the gaps between the recent forms. (E. C.)

ARUM FAMILY, ARACEÆ, a natural order of plants easily recognized by the flowers being enclosed in a spathe, which serves the purpose of a perianth in other classes of plants. The flowers are without calyx or corolla, except as these may be represented by mere scales, and are set closely together on a stalk arising from the centre of the spathe, which is known in this order as the spadix. The sexes are in separate flowers, the females at the base, and generally succeeded by berries, which are often red, and very ornamental. Besides these characters, by which the order may be readily distinguished, there are others of a more minute character connected with the structure of the seed which the critical botanist relies on to guide him in doubtful cases. The common Calla of gardeners (*Richardia Æthiopica*) is a familiar representative of the Arum family. They are mostly natives of tropical countries and of places which have so far been but little explored, and as a consequence new genera and new views of old genera and species are continually being presented. In Linnæus's time *Arum* was the only genus distinguished. In 1846, when Dr. Lindley issued his *Vegetable Kingdom*, he gave 26 genera and 170 species as the extent of the order. But so great has been the increase of knowledge of them since that time that Engler in his monograph issued in 1879 describes nearly 100 genera and about 1000 species. Many of these were formerly referred to *Arum*, only 15 species being now left to this original genus. Some of them grow to immense size for herbaceous plants—that is, such as die to the ground annually; one, *Godwinia gigas*, discovered in the Chontales Mountains of Nicaragua by Dr. Berthold Seemann, has a petiole three metres in length, with the lamina or leaf-blade one metre in width. The flower-stalk is one metre in length, and the spathe, when expanded, four or five decimetres across. Others, with perennial stems, or rather aërial rhizomes, attach themselves by aërial roots to trees or rocks, often ascending to great heights. An acrid principle pervades most of them, giving great pain if taken into the mouth; but the fruit of some is quite wholesome, that of *Philodendron pertusum* being indeed regarded as excellent. It produces a cluster of whitish-brown fruit as large as a white-pine cone. An amylaceous substance pervades many of their roots, or stems in some cases, which is equal to sago, and often sold as of that class of farinaceous food.

From tropical America a few enter the United States, confining themselves, however, to the Atlantic seaboard, some of these reaching Canada. The genera of the United States are *Arisæma*, in which are the Indian Turnip, *A. triphyllum*, and the Green Dragon, *A. Dracontium*; *Peltandra*, *P. Virginica* being the Arrow Arum; *Orontium*, having the Golden Club, *O. aquaticum*; *Calla palustris*, the Water Arum; *Pistia spathulata*, the Water Soldier; *Symplocarpus fœtidus*, the Skunk Cabbage; *Acorus Calamus*, the Sweet Flag; and *Xanthosoma sagittifolium*, a pretty water-plant only found in a few localities in North Carolina. *Arum* (calocasia or caladium) *esculentum*, the "Tanyan" plant, introduced from China, is also common in cultivation. The best known of the indigenous species is perhaps the Indian Turnip, also called Jack-in-the-Pulpit and other familiar names. The roots are about the size of walnuts, and give one-fourth of their whole weight in amylaceous matter. Acrid when raw, they are wholesome food when roasted. Many medical authors have recorded instances of benefit from the use of these plants in a great variety of disorders; for a full list of which see Dr. Peyre Porcher's *Resources of the Southern Fields and Forests*. The Sweet Flag grows in almost all parts of the earth, as well as in the United States, and has a strong and fragrant odor and an aromatic taste. It is a stimulating tonic, and has some of the virtues possessed by cinchona. In India it is highly esteemed in connection with diseases of the bowels. Scraped of its outer bark, it is often found in the farmers' markets in the Atlantic ports of the United States, where it is freely bought as a domestic medicine. It is not the calamus of the ancients, though for a long time supposed to be so, and from this supposition it derives its specific name. (T. M.)

ARVICOLINÆ (Lat. *arvum*, a field; *colo*, I cultivate), one of the several sub-families into which the great rodent family *Muridæ* (rats and mice, etc.) is divided, embracing several genera and many species of small rodents commonly called "field-mice," as well as the lemmings, voles, etc. In general appearance the *Arvicolinæ* differ much from the *Murinæ* (typical representatives of which are the too well-known house-rat and house-mouse); in shape they are squat, bunchy, and heavy, with short limbs and tail, very small eyes, blunt muzzle, inconspicuous ears; and their technical characters are not less well marked. Sharing with *Murinæ* the dental formula *i.* $\frac{1-1}{1-1}$; *c.* $\frac{0-0}{0-0}$; *pm.* $\frac{0-0}{0-0}$; *m.* $\frac{3-3}{3-3}=\frac{6}{6}=16$; the union below of tibia and fibula; the distinctness of the coronoid, condylar, and descending process of the mandible; and the character of the anteorbital fissure,—the *Arvicolinæ* are readily distinguished, as follows:

MURINÆ. Molars rooted, tubercular, with crenate periphery. Incisors compressed, narrower transversely than in the opposite direction. Root of under incisor causing a protuberance on outer side of the mandible at or near notch between coronoid and condylar processes. Descending process of mandible a broad, flattened plate, wholly below the plane of the molars. Anterior root of the zygoma deeply nicked at the interorbital foramen. Zygoma (usually) dipping down to level of the palate. Palate nearly plane. Nasal bones projecting anteriorly.

ARVICOLINÆ. Molars normally rootless (except in *Erotomys*), perennial, with flat crown and serrate periphery. Incisors often broader transversely than in the opposite direction. Root of under incisor causing a protuberance, if any, on the inner side of the mandible between condylar and descending process. Descending process of the mandible hamular; the apex of the hook attaining the level of the molars. Anterior root of zygoma not obviously nicked. Zygoma not dipping down to the level of the palate. Palate highly arched. Nasals not produced beyond pre-maxillaries.

Although the dental formulæ of the two sub-families are the same, there are great differences in the character of the teeth themselves. The small rooted and tuberculate molars of *Murinæ* contrast strongly with the large, heavy, flat-topped prismatic molars of *Arvicolinæ*, which, as a rule, continue to grow for an indefinite period from persistently patulous pulp-cavities. Such grinders as these, together with the broad and hard scalpriform incisors, represent an extreme case of rodent dentition.

One of the genera of *Arvicolinæ* (*Cuniculus*) offers the curious case that a portion of the horny substance of the fore claw is regularly shed and renewed in a manner analogous to the casting of deer's antlers, the moult of birds' feathers, and other periodical ecdyses of tegumentary structures. The fore claws grow to enormous size, and acquire a great deposit of horny substance on the under side. This after a time becomes divided by a nick and a groove from the main part of the claws, and eventually falls off.

The *Arvicolinæ* are specially characteristic among *Muridæ* of the northern hemisphere. In North America none are known to occur farther south than Mexico, where there are few in comparison with *Murinæ*. They extend to the very shores of the Polar Sea, and swarm in myriads in the sphagnous swamps of the Arctic regions. They are fond of low, moist, alluvial soils, and some, like the European vole or "water-rat," *Arvicola amphibius*, or the North American *A. riparius*, are highly aquatic. Some, as the lemmings (genus *Myodes*), are famous for their extensive migrations at irregular periods; they appear in countless numbers, and seem urged on by such irresistible impulse that nothing—not even broad rivers or populous towns—proves an effectual barrier to their blind course. Occurring in such vast multitudes, the *Arvicolinæ* are one of the principal sources of food-supply to the beasts and birds of prey in high latitudes, and in cultivated districts prove one of the most serious obstacles against which the agriculturist has to contend. Carnivorous quadrupeds being always exterminated or greatly reduced in numbers with the settlement of a country, the most efficient natural checks upon the multiplication of the extremely prolific Arvicolas which are left to assist the farmer in his warfare are the birds of prey, especially the hawks and owls; and this fact should be borne in mind by those who are disposed to destroy such birds as "vermin." The Arvicolas are, in fact, the principal food of various species of hawks and owls, without whose friendly assistance the damage done to the crop in all stages of its growth and harvesting would be much more serious. The Arvicolas are great burrowers in soft soil, where they construct extensive runways and storehouses, as well as the nests proper in which their numerous progeny are reared.

The leading genera of *Arvicolinæ* are only too well represented in North America. They are as follows:

1. ***Evotomys***, Coues. Dentition as in *Arvicola* proper, but molars each two-rooted; middle lower molar like the last one, with three transverse triangles seriatim, instead of alternating lateral triangles; lateral triangles of front lower molar rather opposite than alternate. Inward folds of enamel generally not fused along middle of teeth. Coronoid process of lower jaw short, its apex far below the level of the condyle. Bony palate ending posteriorly with a straight transverse shelf opposite the middle molar, the whole space between the last molars thus left open. General outward configuration of *Arvicola* proper, but ears overtopping the fur. This furnishes a connecting link between *Arvicolinæ* and *Murinæ*. The type-species *E. rutilus*, Pall., is of circumpolar distribution. The common red-backed field-mouse of the Northern United States is a variety of this, *E. rutilus gapperi*.

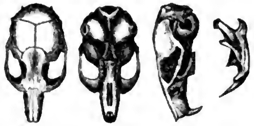

FIG. 1.—Cranial characters of *Evotomys*.

2. ***Arvicola***, Lacép. This is the typical or central genus of the sub-family, divisible into several sub-genera, chiefly according to the details of the dentition. Its limits vary with different writers, some making it nearly coextensive with the sub-family. As defined by Coues in 1877, it offers the following characters: Crowns of the rootless, perennial prismatic molars plane, divided into several closed islands of dentine by folds of the surrounding sheet of enamel meeting from opposite sides and fusing along the median line (not so in *Evotomys*); the saliencies and re-entrances of the alternating prisms strong and sharp, and equally so on both inner and outer sides of the molar series, which appears therefore equally serrate on both sides (not as in *Myodes* and *Synaptomys*). Anterior upper molar of five prisms—one anterior, two interior, two exterior. Middle upper molar of four (or five) prisms—one anterior, one interior, two exterior, the latter sometimes giving off a supplementary postero-interior one. Posterior upper molar of four to seven prisms, of which the first is always anterior and transverse, the last a trefile (of variable shape in different sub-genera), and the intermediate ones are lateral and alternating. Anterior lower molar of five to eight prisms, of which the anterior forms an irregular trefile, the posterior a transverse loop, the intermediate ones alternating lateral closed triangles. Middle lower molar of four or five prisms, the last forming a transverse loop, the rest alternating lateral triangles. Posterior lower molar abruptly narrower than the rest, never of more than three prisms (not so in *Synaptomys* and *Myodes*) seriatim, each making a loop without lateral or alternating triangles. Upper incisors plane (grooved in *Synaptomys*). Roots of under incisors running past the last molar, and thence up the back of the condylar process, forming a thickening of the mandibular ramus or a strong ridge which subsides at the notch between the condyle and the descending process (otherwise in *Synaptomys* and *Myodes*). Posterior termination of bony palate never a single abrupt transverse shelf (as in *Evotomys*, *Myodes*, and *Synaptomys*), but palate ending between posterior molars by excavation to a conspicuous fossa on each side, between which is the narrow median fissure of the posterior nares, leading directly out to the pterygoids. Incisive foramina short and close, midway between incisors and molars, attaining neither. Nasal bones anteriorly subtruncate opposite incisive alveoli; posteriorly subequal or equal to nasal branches of the pre-maxillaries, which reach nearly or quite to opposite the orbits. Coronoid process of the mandible rising as high as the condyle (not so in *Evotomys*). General form typical of the sub-family; ears well developed (compare *Myodes*), but not noticeably overtopping the fur as in *Evotomys*. Fore feet one-half to two-thirds as long as the hind feet; palms mostly naked, tuberculate; thumb obsolete, represented by an obtuse sessile nail. Hind feet with soles neither entirely naked nor entirely furry, 5- or 6-tuberculate, 5-digitate. Tail terete, hairy, sometimes densely hirsute, always longer than the sole, generally exceeding the head. This genus is the most extensive one, embracing the majority of the species of the sub-family. It is divided, chiefly according to details of the molar pattern, into several sub-genera, as *Myonomes*, *Chilotus*, *Pedomys*, *Pitymys*. To the former of these belong most of the North American species, among them *Arvicola riparius*, the common "field-mouse" of the United States from Atlantic to Pacific, and from the Arctic regions to Mexico, but split into several local races or sub-species. *A. xanthognathus* is a very large species of the Arctic regions. To *Pedomys* belongs the *Arvicola austerus*, very common in the Western States and adjoining Territories, especially Illinois, Missouri, and Michigan. The type of *Pitymys* is *Arvicola pinetorum*, the "pine-mouse" of the United States, chiefly east of the Mississippi and rather southerly.

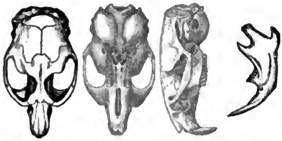

FIG. 2.—Cranial characters of *Arvicola* (*riparius*).

3. *Synaptomys*, Baird. Root of inferior incisor ending abruptly opposite last lower molar. Faces of upper incisors longitudinally grooved (unique in the sub-family). Palate ending behind as in typical *Arvicola*; construction of molars as in *Myodes*. External characters as in *Arvicola*, but ears equalling or overtopping the fur. A remarkably isolated form, intermediate between *Arvicola* and *Myodes*, or the field-mice proper and the lemmings. Type and only known species, *S. cooperi*, Baird, from Indiana, Illinois, Kansas, etc., to Alaska.

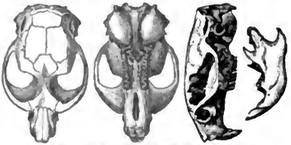

FIG. 3.—Generic characters of *Synaptomys*.

4. *Myodes*, Pall. (lemmings). Molar series long, strongly convergent anteriorly, the individual teeth large, strictly of the prismatic type characterizing *Arvicolinæ*, but in details of their pattern different from those of any other genus excepting *Synaptomys*, the saliencies and re-entrances being unlike on opposite sides of each tooth; roots of under incisors as in the last, but upper incisors plane, as usual in the sub-family. Skull low, broad, and massive, the zygomatic width upwards of two-thirds the whole length. Size of the larger *Arvicolæ*; form very stout; colors usually variegated, and changeable to the season, but not turning white in winter, as in *Cuniculus*; external ears and tail very short, the former not coming to level of the surrounding fur, the latter scarcely or not longer than the sole, and bushy like a rabbit's. Fore claws fossorial and largely developed, but not having the peculiar deciduous horny process found in *Cuniculus*. The type and best-known species is the Norway lemming, *M. lemmus*, L. The only well-determined North American species is *M. obensis*, apparently identical with the Siberian species of that name. All are confined to high lati-

tudes, not known to reach in North America so far south as the United States.

5. *Cuniculus*, Wagl. Skull more massive than in *Arvicola*, rather less so than in *Myodes*, the zygomatic width not two-thirds the total length. Front upper molar of seven prisms (five in *Myodes*); middle upper molar of six prisms (four in *Myodes*); front lower molar of nine prisms (five in *Myodes*); all the lateral triangles of all the teeth alternating and much alike on opposite sides of each tooth. External form stoutest and most compact in the sub-family; no external ears; tail short, its vertebræ shorter than sole; pelage very dense, variegated in color, turning white in winter. Palms and soles always furry. Third and fourth digits of fore feet much longer than second and fifth, their claws periodically hypertrophied, and as if duplicated by an enormous growth of the horny substance, eventually shed. The type and only known species is *C. torquatus* (Pall.), of circumpolar distribution.
6. *Fiber*, Cuv. (muskrats). Largest of the sub-family. Form arvicoline, but tail nearly as long as the trunk, nearly naked, with reticulate scales, and flattened in the vertical plane to form an efficient rudder in swimming. Hind feet set obliquely; soles naked, 4-tuberculate; toes incompletely webbed. Under fur woolly, but the longer hairs glossy. Mammæ six. Dentition strictly arvicoline; cranial characters thoroughly arvicoline, with some generic peculiarities. The common muskrat, *Fiber zibethicus*, the type and only species, is one of the best-known quadrupeds of North America. Its aquatic habits, large size, and long, flat, naked, scaly tail give it an aspect differing greatly from that of ordinary *Arvicolinæ*, of which sub-family, however, it is a strict component, agreeing in all essential characters.

For additional information, see FIELD-MOUSE, LEMMING, MUSKRAT. (E. C.)

See Vol. II. p. 590 Am. ed. (p. 675 Edin. ed.).

ASBESTOS. While asbestos has been known for a long time, and while its peculiar properties appear to have been made of use in early times, its use upon a commercial scale is quite recent. It is first mentioned as woven into fabrics or made into paper, but so small were the quantities used that it could not be regarded as anything more than a curiosity until within the present century. The mineral appears to be closely allied to talc and soapstone, and is regarded as a variety of hornblende. It is found in greater or less quantities in all parts of the world. It is mined in large quantities in Canada, Virginia, North and South Carolina, Maryland, Delaware, and on Staten Island in New York. It is also obtained in quantities in Italy, and is found occasionally in Northern Vermont and New Hampshire. The finest quality is found in veins varying from half an inch to four inches wide and bedded in serpentine rock. The more common varieties, with less flexible or "woody" fibres, are often obtained in masses or lengths from one to three or four feet. It varies greatly in character, being sometimes pure white and of a long staple or fibre, and sometimes flocculent or like woody fibre, or resembling clay or soapstone, or even in a granular form. In color it ranges from white with greenish and metallic reflections through many shades of yellow to dull brown or reddish. The reddish varieties appear to be colored with an admixture of oxide of iron. The most valuable property of asbestos is its power to resist high temperatures, which is indicated by its name, "unconsumable." Some varieties are unaffected by heat up to 2000° Fahr. Other kinds can only be vitrefied at 3000° Fahr., and some kinds have been submitted to a temperature of 5000° Fahr. without apparent change.

Nearly all of the present uses of asbestos appear to be due to the inventions of H. W. Johns of New York. Thread had been spun from asbestos and fabrics woven many centuries ago, and paper has been made in Italy within the past fifty years. Patents on the use of asbestos for a lining for safes were taken out in England as early as 1834, and on lampwicks in 1818 and 1857. American patents were also issued on the use of asbestos for fire-brick and crucibles, as an absorbent in lamps and carburetters, as a packing for engines, as a boiler-covering, for radiating and incandescent surfaces, for gas-stoves, as a lubricant and anti-friction bearing, as an insulator, for coffins, and for various moulded articles. Mr. Johns's applications of asbestos appear to have done more to develop the production of the mineral and make it available upon a large scale than any of those discovered or invented before. Some of the applications mentioned were merely tentative or experimental, and chiefly interesting as showing the progress of invention in this field. Some—so far as can be learned, the greater part—have proved of commercial value. In all the applications of asbestos the underlying idea is the same—to produce a material that will resist high temperatures or something that will be unchanged by fire.

Mr. Johns's applications of asbestos are in part modifications of previous discoveries, such as the manufacture of asbestos paper, but the larger part are novel and original. Of these new uses for asbestos a large proportion have been introduced upon a commercial scale in manufactures and the arts. The most important are the use of asbestos in making paints, roofing-materials, including cement and coatings, asbestos cement felting, lining felt, retort cement, asbestos concrete coating, asbestos paper, mill-board, and sheathing. These materials are composed wholly or in part of asbestos, and all are designed, in greater or less degree, to resist the action of high temperatures.

The asbestos paints are composed of ground asbestos and coloring-matters, and are for covering interior woodwork. The paint when dry forms a mineral coat that, while not absolutely fireproof, will protect the wood from sparks and light flames. The roofing-materials include a roof coating and a cement for repairing metal roofs, and are designed as a protection against sparks. The ground asbestos also serves as a binding material, taking the place of hair or other fibre in the roofing cements. The cement felting is a compound of fibrous asbestos with other materials, and is designed to be applied to steam-pipes, boilers, stills, furnaces, or other heated surfaces where it is important to confine the heat and prevent its radiation. To form a still more durable and perfect insulator for heat the asbestos is made into a lining felt. It consists of a felting of asbestos to which is attached a wadding of flocculent asbestos. This is designed to be wrapped round boilers and steam-pipes in one or more layers, the flocculent asbestos forming a sponge-like air-chamber over the hot surfaces. For packing steam-cylinder pistons, flange-joints, hot-air joints, cylinder-heads, and making gaskets, asbestos has proved of the greatest value. It is made in the form of yarn or wicking or rope, or in flat pieces or like mill-board. For protecting the joints of gas-retorts or making repairs in gas-works the asbestos is made in the form of a cement. It resists the action of acids as well as heat, and finds a great many useful applications wherever a material is wanted that will withstand great heat without shrinking or cracking. The color of asbestos twine, rope, wicking (for packing, and not for lamps), paper, and mill-board is grayish white. It feels soft and greasy to the touch, like soapstone or talc, but is clean, and in the form of fine flour can be rubbed away between the fingers to an invisible powder. The thinnest paper is unaltered by direct exposure to fire, and in larger masses or in tufts and bunches in gas-stoves merely glows with a white heat, and is unchanged short of the highest temperatures.

The finest asbestos was discovered in Canada in 1874. This mineral is almost pure white, and can be spun into thread and woven into fabrics. The mineral from the mines is first crushed and cleaned from the rock that adheres to it, and is then shredded or torn up preparatory to the carding and spinning. In spinning, the asbestos is made into fine thread or small rope, and this is in turn made into large rope or yarn, the largest rope being three inches in diameter. The fabrics woven from this asbestos are used for filter-linings and for lagging for steam-boilers. The finer threads and yarn are used for stuffing steam-pipe joints, and the large rope is used for piston-packing. The shorter staples of asbestos are used for mastics, cements, and felts, and the finer qualities are ground up for making paints, paper, and mill-board.

All of these applications of asbestos are comparatively new, and only after the mineral began to be used in these directions was its production in large quantities stimulated. While it was merely a curiosity it was only found here and there in geological cabinets. It is now regularly mined, and is used in great quantities in all parts of the world, the demand leading to the opening of new mines, and the mines in turn lowering the price, and this in turn increasing its consumption. Very many new applications of asbestos are under experiment in this and other countries, and there is every prospect that it will steadily increase in usefulness. (C. B.)

ASBJÖRNSEN, PETER CHRISTEN, a celebrated Norwegian story-writer, zoologist, and economist, was born at Christiania, Jan. 15, 1812. Through his poverty he was prevented from entering the university at Christiania until 1833, and was obliged to interrupt his studies to gain a livelihood as a family tutor. He devoted himself to medicine and zoology. While yet a student he had begun to gather from the lips of peasants old stories and traditions, and in 1838 the first fruits of his labors in this field were brought before the public. In 1842, in company with his friend Jörgen Moe, who had labored zealously in the same field, he published the first collection of the celebrated *Norwegian Folk-Lore*. The young poets had to contend with many difficulties before their work appeared, but when they had succeeded in giving it to the public indifference gave place to admiration, and critics vied in praising the newly-discovered treasures and the skilful manner in which they were presented. Asbjörnsen's next work was the *Fairy Tales*, or rather "Mountain-Spirit Stories" (*Norske Huldre-Eventyr*, 1845–48). The legends are framed in a free poetic narrative, describing vividly the romantic scenery and the hardy people of his native land. These sketches still remain the best and most lifelike pictures of Norwegian scenery and character. In 1849, Asbjörnsen made a voyage in a man-of-war to the Mediterranean, and after his return published sketches of sea-life which enhanced his reputation. Aided by the university, Asbjörnsen made several zoological journeys along the coast of Norway, and discovered many rare animal forms. In 1853 he had the good fortune to find, at considerable depth off the coast, a new starfish (which he called *Brisinga*, from the necklace of Freyja, which, according to the Scandinavian mythology, was hidden in the depths of primeval time). This "*Brisinga endecacnemos* Asbjörnsen" afterwards excited great interest in connection with other discoveries indicating a survival of the fauna of the Cretaceous period in the depths of the ocean. It thus suggested the deep-sea exploring expeditions which have since been despatched from England and America, and which have secured valuable additions to science. Having obtained a public stipend, Asbjörnsen went to Germany in 1856, and spent two years in the study of forestry. On his return to Norway he was appointed forest inspector, and spent some years in this capacity. His desire to improve the mode of living among his countrymen is shown by his publication of a cook-book in 1863. In the next year he was sent by the Government to investigate the peat-industries of Denmark, Holland, and adjoining countries, and on his return was appointed peat commissioner, which office he held till he resigned it in 1876 on account of his age, and was pensioned. In 1878 the valuable zoological collections which he had made during his travels were purchased for the Dublin Museum of Science and Art.

The volume of *Norwegian Tales* published by Asbjörnsen and Moe in 1842 was in literature as well as in language a deliverance from the tyranny of Danish intellect, though it did not produce this effect immediately. Through the "Mountain-Spirit Stories" the previous volume obtained a new significance, and it then became more and more evident that the foundation of a national Norwegian literature had been laid. On this corner-stone the whole succeeding intellectual development of Norway rests. By these masterpieces the true significance of the folk-lore as the direct expression of the mind and character of the people was first manifested. "Here the most exquisite art is combined with the purest nature, simple instinct with deep reflection; and here the innocence of true hearts gleams like a jewel in a crystal case." Moe afterwards gave over the results of his researches entirely to Asbjörnsen, and the latter had the satisfaction of helping to build the walls as well as to lay the foundation of a truly national literature. The most popular writers of the present day acknowledge their indebtedness to him; take, for instance, Björnsterne Björnson's emphatic declaration: "Had Asbjörnsen not lived, little would have been known of me." Asbjörnsen has translated several popular books from German and English. Of *Juletræt* ("The Christmas-Tree"), story-books for children. He has published four volumes (1850, 1851, 1852, 1866). Others of his works are *Naturhistorie for Ungdommen* (6 vols., 1839–49); *Om Skovene og om et ordnet Madstel* (1864); *Torv og Torvdrift* (1868). In 1871 he published a new collection of *Norwegian Stories*, with additions from the memoranda of Jörgen Moe. In 1879 a complete edition of his stories was issued, illustrated by the best Norwegian artists. Asbjörnsen has also furnished the text for several art-volumes illustrating Norway. Several of his works have been translated into Swedish, German, English, and French. He has recently designated Prof. R. B. Anderson of the University of Wisconsin as the authorized American translator of his folk-lore stories.

See also *La Vie et les Œuvres de P. Chr. Asbjörnsen*, by Alfred Larsen (Christiania, 1873), and a sketch by Edmund W. Gosse in *Round the Yule-Log, by P. C. Asbjörnsen* (London, 1881). (M. M.)

ASBURY, FRANCIS (1745–1816), the first bishop of the Methodist Episcopal Church ordained in America, was born at Handsworth in Staffordshire, England, August 20, 1745. His parents were pious Methodists; at sixteen he became a local preacher, and at twenty-two an itinerant. After three years' service in England he was appointed missionary to America, and landed at Philadelphia Oct. 27, 1771. Next year he was appointed by Rev. John Wesley his general assistant in America. He infused new vigor into the itinerant system, sending missionaries in all directions to found new societies. The political agitation of the times greatly impeded this work, and the outbreak of hostilities suspended it; so that in 1777, after a conference held in Maryland, and when all the other ministers who had come from England returned thither, Asbury resolved to remain to look after the religious wants of the struggling colonists. Being, however, a nonjuror on conscientious grounds, like many clergymen of the time, he was frequently exposed to trouble from magistrates and others who could not understand his position. In 1778 he retired to a friend's house in Delaware, where he remained in comparative seclusion for two years. On the return of peace it was deemed expedient to establish an independent Methodist Episcopal Church in America. For this purpose, on Sept. 2, 1784, Rev. Thomas Coke was ordained by John Wesley as superintendent of the Methodist societies in America, with instructions to ordain Asbury as joint superintendent. When the organization was effected, Asbury declined the appointment unless he were chosen by his brethren, whereupon he was unanimously elected bishop, and was consecrated by Dr. Coke, Dec. 20, 1784. From this time till his death his personal history is the history of the growth of Methodism. His *Journal* (3 vols., New York, 1852) contains a wonderful record of apostolic zeal and fidelity. His salary was only $64 a year; his horses and the carriage he was obliged to use in his later years were the gifts of his friends; all donations of money he assigned to his fellow-laborers. He travelled every year from Canada to the Mississippi, averaging 6000 miles, often through pathless forests and trackless swamps. He constantly distributed Bibles and religious tracts before any society for this purpose had been formed, and is said to have instituted Sunday-schools in some places. He was regarded with affectionate reverence by all to whom he ministered. Hundreds of children were named for him, and at his death he directed that a Bible should be given to every one of his namesakes—a wish which was carried out as far as possible by his executors. He never married, giving as his reason the peculiar circumstances of the times and the onerous duties of his position, which he could ask no one to share. The Methodist Church grew in his lifetime from a feeble band of four preachers to nearly 750 itinerants, 2000 local preachers, and 214,000 members. He ruled this body to the last with equal firmness and charity, having presided in 244 annual conferences. In spite of his defective education he had acquired a tolerable knowledge of Greek and Hebrew, and as early as 1785 laid the foundation of a Methodist college. He continued to travel and to preach when he was so weak that he had to be carried to the pulpit. He died in Spottsylvania, Va., March 31, 1816.

ASBURY PARK, an incorporated borough of Monmouth co., N. J., is situated on the Atlantic Ocean, 4 miles south of Long Branch, 51 miles by rail from New York City and 70 miles from Philadelphia. It is chiefly a summer resort, though some New York merchants and other people reside there the year round. There are 250 hotels and boarding-houses, and about the same number of private cottages. There are six churches, three public halls, and a graded school with 900 children enrolled. Two weekly newspapers are published here, and during the summer a daily edition of each is issued. Along the ocean-front, fully a mile, extends a broad plank promenade supported on piling and furnished with settees, and having three fine pavilions jutting out into the sea. The avenues running to the ocean are 100 feet wide, increasing in width as they approach the beach, which is of clean white sand. The surf-bathing is excellent, the climate mild and equable. Besides saw-mills, planing-mills, sash. door, and blind factories, there is an establishment where steel dies and roller-moulds are made for embossing paper, foil, velvet, etc. This is the only establishment of the kind in America, most of the rolls and dies used in this country being imported. Asbury Park originated in the enterprise of Mr. James A. Bradley, a wealthy brush-manufacturer of New York, who in 1869 purchased for $90,000 a square mile, now comprising its territory. The land was then a wilderness, and the owner laid out avenues and lots, determining to make a strict temperance town. In every deed he gave he stipulated that no liquor should be manufactured or sold on the property conveyed, under penalty of the reversion of the property to him. In 1872 the borough was incorporated by act of the State legislature, and its government placed in the hands of a board of four resident and three non-resident commissioners. In 1875 the New York and Long Branch Railroad was built to Asbury Park, bringing the metropolis within two hours' distance. The Pennsylvania Railroad also made a connection to Philadelphia, and the former road is partly under its control. The assessed valuation of Asbury Park in 1881 was $1,250,000, which is two-thirds of the real value; the public expenses were $7152, and the bonded debt is $4000. The winter or permanent population is 4000, and the summer population is from 20,000 to 25,000.

See Vol. II. p. 594 Am. ed. (p. 680 Edin. ed.).

ASH. In America, ash timber is chiefly the product of *Fraxinus Americana*, the White Ash, though the Blue Ash (*F. quadrangulata*), Black Ash (*F. sambucifolia*), Green Ash (*F. viridis*), Red Ash (*F. pubescens*), and the Oregon Ash (*F. Oregana*) contribute a good share. The timber of all the species is of about equal value, though that from the White Ash is in the greatest demand. It is regarded as about second to oak in commercial importance of all the hard woods. The name *ash* is a very ancient one, and is believed to be derived from the Latin *ascia*, or *axis*, an axle, from the wood of the European Ash (*F. excelsior*) having been universally employed in old times for wagon-axles, as it generally is still. The wood is tough and elastic, and yet comparatively light. Experiments reported in the *Proceedings of the American Philosophical Society* show that, taking the specific gravity of hickory as 1·00, that of ash would be ·77, and cottonwood ·39; oak, tested at the same time, ·85. It is very popular for parts of farm implements, oars, furniture, and the interior parts of dwellings, floorings, mill-work, staves and hoops for tubs and barrels, and many household utensils. The Black Ash splits easily into tough, thin pieces, and was the chief wood employed by the Indians of Pennsylvania in coarse basket-work. All Ashes love damp, rich earth, but the Black especially so,—and the Indians, on selling their lands, often reserved the right to come once a year and cut Black Ash over several hundred feet in width along the creek-bottoms. This right was exercised up to the first quarter of the present century along the upper portion of the Wissahickon in Eastern Pennsylvania, which was once a famous locality for Black Ash. The Ash thrives best in cold climates, hence it is very abundant in Canada, and large quantities are annually exported to the United States, notwithstanding the comparative abundance of Ash trees there. During the twelve years preceding the establishment of the Dominion Government there was an average of 3415 tons a year, valued at $20,000, sent to the United States from Canada, and in one single year (1877) 10,181 tons, valued at $106,386. From 1874 to 1879 there were more logs of Ash sent through the Government boom on the Ottawa River than of all other hard woods together, oak included, the total reaching 16,330. In the Northern United States it is so highly esteemed that in Massachusetts and Iowa premiums have been offered specially for its culture. In Iowa the White and the Green Ash are the two most popular kinds. The Green in that State grows much faster than the White, but does not make so tall a tree. The Red Ash, though not growing so tall as the White. often makes a large trunk. One growing near Springfield, Mass., at three feet from the ground measured nine feet in circumference. The White Ash derives its name from the color of the bark, as also does the Black; the Green from the green wood and leaves; the Red from the rusty down beneath the leaves in the fall of the year; and the Blue from a dye of that color which can be made by the use of the inner bark. Ash timber may not, on the whole, be equal in commercial importance to oak, but while the latter requires drier soils to reach perfection, the Ash thrives in low lands or where there is considerable moisture. The Ash does not flourish well in forests, like the oak, as it has more surface- and fewer descending or tap-roots.

There are a few species of Ash in Europe and Asia, but they are at home chiefly in North America, where there are twelve species known, about half of them being too small for timber purposes. The White Ash is found naturally all over the Atlantic portion of Canada and the United States, crossing the Mississippi even into Nebraska, and, though attaining its best development in the north, has been found eighty feet high in North Carolina. The Blue Ash is found at its best between the Ohio and the Missouri rivers. Its range north and south is from Michigan to Tennessee. The Carolina Ash (*F. Caroliniana*) is the prevailing species in the south, but has no reputation as a timber-tree. Though the Ash generally is most popular in connection with work which will not be much exposed to the weather, the Blue Ash has some popularity in Ohio for posts and rails in fences. Experiments in Illinois with ash-planting show that the White Ash will grow from seed thirty feet in twenty years, and make a circumference of three feet in that time. It is, however, useless to attempt profitable ash-culture in dry or poor soils. (T. M.)

ASHBURTON, ALEXANDER BARING, BARON (1774–1848), an English merchant and statesman, was born Oct. 27, 1774. He was the second son of Sir Francis Baring, the founder of a large London mercantile house. Being sent by his father to the United States in the service of the house, he married, in 1798, Anna, the eldest daughter of William Bingham, a wealthy merchant of Philadelphia. Returning to England, he published a pamphlet *On the Orders in Council* (1808), in which he discussed the treatment of American commerce by Great Britain. On the death of his father in 1810 he became head of the firm of Baring Brothers & Co., and in 1812 he was elected to Parliament. He was there at first a Liberal, but after the passage of the Reform Bill of 1832, which he had opposed, he was a moderate Conservative. In the administration of Sir Robert Peel he was president of the Board of Trade and master of the mint, and in April, 1835, he was made a peer by the title of Lord Ashburton. This title had originally been conferred on John Dunning, a distinguished lawyer, but had become extinct on the death of his son, Alexander Baring's cousin, in 1823. On account of his familiarity with the institutions and people of the United States, he was appointed by Sir Robert Peel on a special mission to settle the vexed question of the north-eastern boundary. The result of the negotiations was the famous Ashburton Treaty, concluded at Washington Aug. 9, 1842. By it the present boundary between Maine and Canada was established, and though for a time it was severely criticised by extreme partisans both in America and in England, it has long been regarded as an equitable compromise of the matters in dispute. The treaty also contained provisions for the suppression of the African slave-trade and for the mutual extradition of fugitives from justice. The British Parliament gave Lord Ashburton a vote of thanks for the settlement of the long-pending controversy, and an earldom was offered to him, but he declined the honor. In the House of Lords he supported the protective system and the reduction of postage. He was noted for the wide range of his accomplishments, and received the degree of D. C. L. from Oxford University. He died May 13, 1848.

ASHEVILLE, the county-seat of Buncombe co., N. C., is 125 miles W. of Charlotte, on the Cincinnati, Cumberland Gap, and Charleston Railroad, and on the Western North Carolina Railroad. The town is on the western slope of the Blue Ridge, 2500 feet above sea-level, and about a mile from the French Broad River, which is here crossed by an iron bridge. Asheville has a court-house, five hotels, a bank, two weekly newspapers, five churches, two schools, and a female college. It has four tobacco-factories, a planing-mill, a foundry, and some minor industries. Population, 2616.

ASHLAND, a town in Boyd co., Ky., is on the Ohio River, 5 miles below the mouth of the Big Sandy River. It has five churches, a seminary, a national bank, and a weekly newspaper. It contains the Norton iron-works and the Ashland furnace, both of great capacity. The Ashland Coal and Iron Railroad and the Chattaroi Railroad run south from this place; the Scioto Valley Railroad is connected with it, the cars being transferred by barges across the Ohio River. The Chesapeake and Ohio Railroad has also been extended to Ashland, and connects there with the Elizabethtown, Lexington, and Big Sandy Railroad. The surrounding district is rich in coal and iron ore. The town was laid out in 1854, and incorporated in 1858. Population, 3280.

ASHLAND, the county-seat of Ashland co., Ohio, is on the New York, Pennsylvania, and Ohio Railroad, 65 miles S. W. from Cleveland and 196 miles N. E. from Cincinnati. It has a national bank, two other banks, two weekly newspapers, eleven churches, and good graded schools. Its industrial establishments comprise two foundries, two machine-shops, and a manufactory of boot and shoe patterns. It was laid out in 1817, and became the county-seat in 1846, when Ashland county was formed. Population, 3004.

ASHLAND, a mining-town in Schuylkill co., Pa., is in the centre of the anthracite coal-field in Mahanoy Valley, 119 miles N. W. of Philadelphia, on a branch of the Philadelphia and Reading Railroad and the Lehigh Valley Railroad. It has eight hotels, a national bank, an opera-house, three weekly newspapers, eleven churches, twenty schools, the Anthracite State Hospital, and an iron and a wooden bridge across Mahanoy Creek. It has two foundries and machine-shops, flour-mills, planing-mills, and manufactures of soap, carriages, carpets, doors, sashes, iron screens, and boxes. It is substantially built, and has a park, gas- and water-works. Its property is valued at $1,200,000; the public debt is $83,000, and the yearly expenses $27,000. About 1836, Stephen Girard built a horse-railroad to carry the first coal mined here. In 1848, Ashland was settled, and in 1857 it was incorporated. The population, largely of foreign birth, is 6052.

ASHLEY, a borough of Luzerne co., Pa., is in the Wyoming Valley, on the Lehigh and Susquehanna Railroad, 3 miles from Wilkes-Barre. It has a hotel, a bank, three churches, two schools, a water-works, a railroad foundry, and a machine-shop. It is a thriving mining-town, being surrounded with rich coal-mines. Population, 2799.

ASHMOLE, ELIAS (1617–1692), an English antiquary, founder of the Ashmolean Museum at Oxford, was born at Lichfield, May 23, 1617. At an early age he was taught grammar and music and was placed in the cathedral choir. At sixteen he commenced the study of law, and in 1638 was admitted as a solicitor in chancery. In 1641 he became an attorney in the common pleas. At the breaking out of the Civil War he left London for Oxford, where he joined the Royalists and became comptroller of the ordnance. At the same time he entered Brasenose College and studied anatomy, natural philosophy, and astrology. After the battle of Worcester he withdrew to Cheshire, and afterwards went to London, where he became intimate with Moore, Lilly, and Booker, the English astrologers of that period. He became steward of their fraternity, which included many distinguished men. In 1647 he went to Berkshire, where he studied botany and married Lady Mainwaring. Her lands were sequestered on account of his being a Royalist, but the sequestration was afterwards removed. He again removed to London, where his house became the headquarters of the astrologers, and in 1650 translated Dr. Dee's *Fasciculus Chymicus* and *Arcanum*. In 1652 he studied Hebrew in order to read the Kabbalistic literature, and in the same year published *Theatrum Chymicum Britannicum*, a collection of old rhyming treatises on the philosopher's stone and the art of transmutation of metals. In 1658 appeared his *Way to Blisse*, which indicated an intention to abandon alchemy and astrology. In the same year he made a catalogue of the coins given by Archbishop Laud to the Oxford University. During the next year he was presented, by the younger Tradescant, with the museum of coins and curiosities made by the latter and his father while curators of the botanical garden at Lambeth. After the Restoration, in 1660, he was called to the bar, became a member of the Royal Society, and was made Windsor Herald and given several other offices. He married a third wife in 1668, was made M. D. by Oxford in 1669, and in 1672 presented the king with his *History of the Order of the Garter*, for which he received a grant of £400. He also wrote a *History of Berkshire*, and a *Diary* of a whimsical character. In 1679 his chambers in the Temple were burned, with a great part of his library, and 9000 of his valuable collection of ancient and modern coins were lost. His valuable manuscripts and the most precious of his gold coins were saved. These he presented to the University of Oxford in 1683, and a building was prepared for them which still exists. By his will his library also was given to the same institution. The order of the Garter was offered to him in 1677, and again in 1686, but he declined the honor on both occasions. He was the first "accepted" or non-operative Freemason, having been initiated in the guild with Col. Mainwaring at Warrington in 1646. He died in London, May 18, 1692.

ASHMUN, Jehudi (1794–1828), agent of the American Colonization Society, was born at Champlain, N. Y., in April, 1794. He graduated at Burlington College, Vt., in 1816, and after preparing for the ministry was professor in the Bangor Theological Seminary, Me. Entering the service of the American Colonization Society, he removed to Washington, D. C., and edited the *African Repository*. Being appointed to take charge of a reinforcement of the colony of Liberia, he sailed in June, 1822, and arrived Aug. 8. He found the colony threatened by formidable enemies, and at once displayed great ability in organizing and encouraging the settlers. Three months after his arrival his little force of 35 men repulsed the attack of 800 savages, and a few days later entirely defeated them. He continued his labors in behalf of the infant colony until March, 1828, when he was obliged to return home on account of ill-health. A few weeks after his arrival he died at New Haven, Conn., Aug. 25, 1828. He published in 1822 *Memoirs of Rev. Samuel Bacon*, and his own *Life* was written by R. R. Gurley in 1835.

ASHTABULA, a city of Ashtabula co., Ohio, is on the Ashtabula River, just south of Lake Erie, and 55 miles east of Cleveland. It is on the Lake Shore and Michigan Southern Railroad, and is the terminus of two of its divisions, one running to Oil City, Pa., and the other to Youngstown, Ohio. It is also on the New York, Cleveland, and St. Louis Railroad, and is the terminus of the Ashtabula and Pittsburg Railway. Over Ashtabula River there are two railroad bridges, one 75 feet high and 150 feet long, and the other 108 feet high and 850 feet long. The former was the scene of a great railroad disaster Dec. 29, 1876. The city has six hotels, two national banks, one other bank, three weekly newspapers, six churches, and six schools. Its industries comprise two iron-foundries, two flour-mills, three machine-shops, two planing-mills, and manufactures of agricultural implements, pumps, carpet-sweepers, skewers, shafts, poles, and carriages. It has a fine harbor and does a large business in shipping coal and iron. The city is lighted with gas and has three parks. Its property is valued at $1,765,000; its yearly expenses are $15,000, and it is free of debt. Ashtabula was settled in March, 1798, by intelligent and industrious emigrants from Connecticut, and was incorporated Feb., 1831. The population in 1880 was 4445, but it has since increased to more than 6000.

ASIA. Travel and exploration on the continent of Asia during the ten years closing with 1882 have been marked by signal examples of daring, endurance, and enterprise, and by large additions to geographical knowledge and the kindred sciences. Horseback rides over the wastes of Central Asia, military expeditions to the seats of power of the ancient khanates, pedestrian journeys along great reaches of country previously untrodden by white men, and the gradual preparation for the introduction of all the varied agencies of modern civilization, are portions of the interesting records of the populous territory lying beyond the eastern frontier of Europe during the period named.

See Vol. II. p. 596 Am. ed. (p. 683 Edin. ed.).

Explorations in 1873.—In this year the Sea of Aral was thoroughly explored by Russian surveyors, and found to be 165 feet above the level of the ocean and 250 feet above the Caspian. They also determined the present course of the river Oxus from its mouth at the Sea of Aral, a distance of 200 miles, and explored the ancient bed of the same stream, finding that the old river flowed in two channels now dry, and that the valley was the seat of a flourishing civilization, there remaining only ruins to mark its former power. During the same year Col. Gordon, of the English mission to Kashgar, crossed the unknown Pamir Steppe at a height of 13,000 feet, and discovered a miserable people, numbering about 1000, suffering all the rigors of an arctic climate, in this hitherto mysterious land. Almost simultaneously, Col. P. Baker and W. E. Gill, R. E., made a journey through Northern Persia, describing Kilat as one of the most remarkable places in the world—not unlike Dr. Johnson's "Happy Valley" in *Rasselas*. It is entered by five gorges, each about three yards wide, the sides of which tower up perpendicularly like walls, so that the valley-fastness is impregnable. The inhabitants live upon what is grown within, and can therefore stand an almost interminable siege. The great surveys of India were simultaneously prosecuted with great vigor, Gen. Cunningham, of the Archæological Survey, discovering the site of an ancient city 120 miles south-west of Allahabad, and identified as one mentioned by Ptolemy. Sixty years before it was buried in a dense jungle. The age of the ruins was determined from the profuse sculptures; they disclose an origin nearly three centuries before Christ. They were regarded by Gen. Cunningham as the most valuable acquisition yet made to our knowledge of ancient India. They record the dresses of all classes at a period of three-quarters of a century after the death of Alexander the Great, their houses, temples, personal ornaments, animals, and throw considerable light upon the religion and habits of that remote era. In 1873, Frank Vincent, Jr., visited and described the ruins of Cambodia, making an important contribution to the literature of travel.

Explorations in 1874.—Nearly 5000 square miles of the Holy Land were surveyed in 1874 by the officers of the British Palestine Expedition, while the American Expedition worked east of the Jordan. Schekanofsky and Müller during this year made a journey to Northern Siberia. They started from Erbokhoger, proceeding along the valley of the lower Tunguska with slow progress, owing to the great severity of the climate, and finally arrived at the confluence of the Kopokit and Olenek rivers, and crossed the massive mountain-chain of Anaon, reaching 66° 26′ north latitude, when they came to a large stream, the Moniero, and returned, after many trials, by way of the Olenek River. The fruits of their travel were rich in geological, botanical, and meteorological material. A further Russian expedition, accompanied by Maj. H. Wood, made an examination of the bed of the ancient Oxus, and determined that the change in the flow of the stream by which its mouth had been diverted from the Aral to the Caspian Sea was occasioned by the obstruction of its waters for the purposes of irrigation, particularly at Khiva, and that if the river had not been interfered with it would have continued its course to the Caspian. Another Russian expedition left Tashkend in April, 1874, for the exploration of Hissar as far as the Oxus. The route lay through Samarcand to Hissar, of which our knowledge was very imperfect, for no modern traveller had ever trodden its soil. It was discovered as one of the important results of the exploration that the rivers Khuziar, Dargas, and Shirabad were not the large streams they were represented to be. The party found that the Surkhan is an important tributary of the Oxus, though the very existence of that river had been doubted by Fedchengo, the late Russian traveller. They also discovered the remains of the remarkable stone bridge over the Sirkab described by Clavigo, the Spanish ambassador to the court of Timur in the fifteenth century, but were not able to identify the position of the famous pass of the Iron Gates, a great natural opening closed by folding gates cased with iron and hung with bells, described by the Chinese missionaries in the seventh century. The geological exploration of the region watered by the Amoo Daria was in 1874 conducted by Barbian de Morney and his scientific associates, and his publications are voluminous and great treasures to the geographer. He closed his explorations, after a journey of 1400 miles on horseback, at Samarcand.

China was also the scene of great activity in 1874. Mr. R. A. Margary, well known as geographer and explorer by his journey from the China Sea to the Irawaddy by way of Yunnan-Fu and Momien, started on a journey from Anko up the Yang-tse-Kiang to meet Col. Browne and Mr. Ney Elias, who were charged with the extension of commercial relations between Burmah and China. He went by boat from Hankow to the province of Quichow, where navigation ends, and then by land, journeying over the magnificent passes to the province of Yunnan. But Margary was murdered by the natives before he reached his destination. Coeval with this bold attempt was the journey of M. du Bernard, a missionary, who travelled among the savage tribes of Lissu. These are nominally subject to Chinese rule, but their intercourse with China and Thibet has not changed their savage nature, as they make raids on surrounding tribes, and live on these incursions wholly by rapine. Gold he found abundant in the country, and small gold balls, weighed in the Chinese scales, are current among the fetish-worshippers as money. The Abbé David likewise explored the northern regions of China, reaching Moupin on the frontier of China proper, where he came into the midst of a race neither Chinese nor Thibetan. Among his discoveries was one entirely phenomenal—that is, monkeys in the woods where there is snow on the ground six months in the year. They showed, however, some marked differences from the monkeys of warm latitudes heretofore known, some of them having a higher range of intelligence. M. Dupois made an exploration during the year of the Hong-Kiang (or Red River) of Tong-King and China. He is of opinion that it will be of great importance to commerce, its trade promising to attain the magnitude of that of the Yang-tse in a few years, opening up communication between the south-west provinces of China and Laos and Thibet—aggregating 50,000,000 people. Dr. Harmand, another French traveller, gave an interesting account of Tong-King (or Tonquin), that part of Annam which lies between Cochin China and the great range of mountains that separates it from the southern part of China. He describes it as a country of great fertility and densely populated. The people are a mild and inoffensive race. The mandarins are hostile to all Europeans, and are cunning, ignorant, and given to intrigue and exaction. Everything in their administration is systematic corruption. The mountains around Tonquin are inhabited by a number of savage races of whom comparatively little is known, but they are the aborigines. The mountain-region to the northward is infested by banditti, chiefly Chinese. One of the provinces, Thankhia, numbering 1,200,000 souls, has about 15,000 Catholic converts.

In 1874, Baron Richthofen, probably the first living authority on China, set down the population of the empire at 415,000,000.

Mongolia also commanded the efforts of several explorers. Capt. I. A. Sosnoski, a Russian, attempted to make his way from China to the Black Irtysh in Siberia. The sources of this river, rising in Western Mongolia, were first explored by him in 1872. He was followed by M. Molusooki, a Russian, who made a journey of 514 miles in the Ektag range of the Altai Mountains, determining a great number of positions and altitudes. M. Morozof, a Russian merchant, despatched couriers from Lake Laisau to Dzungaria and Western Mongolia, an extensive exploration, during which large accumulations of knowledge were obtained, particularly of a geographical character. In Thibet some important explorations were made by a trusted Indian employed by Maj. Montgomery to investigate the unknown country north of the Thibetan water-shed of the upper Brahmaputra valley in a north-easterly direction from Shigatze, going completely around Lake Tengrinor, the existence of which was known from old Chinese authors by that name, but which on the spot is called Lake Namcho, or Sky Lake, and returned by way of Lhassa, the goal which so many ambitious travellers have sought in vain. He found the streams frozen hard, and was struck by the number of hot springs having a sulphurous smell, the water being expelled with great noise and violence like the Western geysers of North America. The lake is 50 miles in length, 25 in breadth, and bounded on the south by a range of snowy peaks 150 miles in length, the highest of which is more than 25,000 feet above the sea. This very important exploration has elucidated the geography of an area embracing 12,000 square miles, and one of the northern tributaries of the Brahmaputra has been thoroughly explored. Capt. G. C. Napier's adventurous journey in Northern Persia developed certain interesting facts. At Shkoh he found abundant coal. Visiting Kilat, and crossing the main chain of the Elburz Mountains, a mass of hard gray limestone, rising with jagged teeth to an altitude of 7000 feet, he passed valleys very fertile and which would feed whole districts, but they were neutral ground, being the battle-ground of the Turcomans and Kurds. Sir Henry Rawlinson refers in the highest terms to the geographical labors of Capt. Napier, and says that when his discoveries are properly worked out they will throw great light on this part of Central Asia. Very important to science were the discoveries of Mr. Bond, of the Trigonometrical Survey of India. He discovered two of the wild dwarfish race who live in the hill-jungles of the Western Ghauts—a race of which, though often heard of, no trace had been previously found. A man and woman were discovered, who appeared to be akin to the pigmy race of Africa made known by Dr. Schweinfurth. They are cannibals, eating also roots and honey, and worship the local divinities of the forest. Studies of the Himalaya range by Col. Montgomery show that the gigantic glacier system of this elevation reaches its greatest development in Baltistan in North-western India. The glaciers increase in size from east to west, and are in many instances more than 20 miles in length, the longest, Baltoro, being 35 miles long. The ice was in some cases 400 feet thick, and the experiments made show that the phenomena of its motion were the same as in the Alps. One of the most daring journeys of modern times was the horseback ride of Mr. J. A. MacGahan across Central Asia to the khanate of Khiva, which was reduced to submission by the Russian expedition of Gen. Kauffman in 1873. MacGahan, an intrepid American, was employed by James Gordon Bennett to make the journey. In the face of the refusal of the Russian authorities, and after encountering every form of opposition, he set out alone, almost unattended, and arrived in the Russian camp in time to witness the fall of Khiva—the only American or European who had ever visited the capital since the journey of Vambéry. In *Campaigning on the Oxus* MacGahan gave a graphic account of explorations and observations, and this notable volume has taken its place in the permanent literature of our time. The direct results of Kauffman's expedition, which was a triumphant success, and unique in this particular when compared with the disastrous failures which marked former Russian attempts at conquest, were that the Russian frontier was advanced 300 miles farther to the southward, 80,000 square miles of territory were annexed, and complete possession of the lower Oxus obtained. MacGahan sums up the political relationship of Russia to Central Asia in a brief sentence amply justified by the subsequent events: "They (the Russians) have occupation enough in keeping the Central-Asian population in subjection."

Explorations in 1875–76.—The years 1875–76 were marked by even greater activity in Asian exploration, particularly in Siberia and North-eastern Asia. A few may be mentioned. Lieut. Sandsberg and Prof. Wagner in the far northern regions; M. Grumm in the country of the Caspian; Gen. Skobeleff in the survey and exploration of the Altai and Trans-Altai mountains and the northern part of the Pamir Steppe; M. Poliakoff in the lower section of the river Obi; M. Chersky upon the Irkoot River; M. Rheinthal from Wjernga to Kashgar; M. Severtslaw in the valley of Ferghana and the neighboring mountains; Mr. Ney Elias in the valley of the Shueli in the western part of the province of Yunnan; M. Potanin in East and North-west Mongolia; Col. Prejavalsky of the region between the Himalayas and the Thian-Shan, China, and Turkistan; Dr. A. Wajeckoff in Japan and Siam; and the Abbé Monbrosier in the exploration of both branches of the Mekong in Cochin China. During this period Col. Bolschef surveyed the Siberian coast between the parallels of 45° and 52° north from Plaslin Bay to Castries Bay. There the country was found to be mountainous, the range traversing the entire coast. Fine timber, lead, copper, silver, gold, and coal were in abundance.

Chekanofsky's expedition during this period to the Olenek and the lower Lena was rich in geological, geographical, and botanical results. He eventually encamped at the mouth of the Olenek, facing the Siberian Sea, where he found the graves of the intrepid Russian explorer Prontschischtschew and his brave wife, who 140 years before sought a passage around the northern coast of Asia to the mouth of the Yenisei River. The expedition of Dr. Otto Finsch along the valley of the Obi to Obdorsk, the most northerly settlement of that river, was undertaken in conjunction with Dr. A. Brehm, curator of the Bremen Museum of Natural History. They made their way to the Kara Sea, and suffered many of the hardships incident to Siberian travel. About the same time Messrs. Sidenser and Lopatin explored the rivers Ket and Chulym in Siberia to discover if it were possible to join the rivers Obi and Yenisei by a canal. Concurrently there were foot-journeys through the mountain-districts of Central Japan, and D. P. Edwards of Bangkok travelled extensively in Siam, gathering a large amount of geographical information. Dr. Andrez made researches in Persia which have been of value to archæologists, and Col. McGregor made practical explorations in the same country as far north as the Russian frontier.

Explorations in 1877.—In 1877 the geography of the Pamir Steppe was enriched by the publication of a map drawn by Jehander Khan, the deposed ruler of Badakshan, containing an itinerary from Ush in Khokand to Lake Kara-Kul; thence in a south-westerly direction to Shighnan, passing through Vomar on the Oxus before turning toward Chitral *viâ* Wakhan and Yassin. Another itinerary on the same map leads from Hissar *viâ* Kolab to Faizabad. A further itinerary communicated to the Russian Geographical Society is from Asken in Eastern Turkistan to Ladak. It is divided into forty-nine marches, making in all 885 miles. This was found in the archives at Omsk, and refers as far back as 1824. The Trans-Himalayan explorations recorded for the year 1877 were of wonderful value to geographers. The "Havildar," an Indian travelling in the disguise of a merchant, left Peshawur in Sept., 1873, with about £300 in muslins and cloths. Leaving Cabul in November, and crossing into Badakshan by the Sar-ulang pass, 12,000 feet high, he arrived at Faizabad, the capital, where he spent the winter. Reaching the Oxus, separating the dominions of Bokhara and Afghanistan, he encountered numerous delays, and finally was not permitted to advance. The "Mullah" was another of these native explorers trained by the British, as was Nain Singh, the most distinguished of them all. Besides penetrating the mysterious land of Thibet to its very capital, Lassa, and determining its true position, he surveyed a new country along a distance of 1200 miles, fixing the positions of 31 places and the altitude of 33. His crowning work was when, having accompanied the British mission to Kashgar in 1873, he volunteered to go on a fourth journey of exploration. His route lay from Leh to Lassa by a line farther north than any previously known—in fact, across that part of the high plateau of Thibet which is almost a blank on our maps. On this journey he discovered an extensive series of lakes and rivers, as well as a vast snowy range to the north of the Thibetan course of the Brahmaputra. Threatened danger drove him across the Himalayas to the southward, and he entered Assam by the Tawung pass, a route hitherto unexplored. The total length of this journey from Ladak was 1319 miles, and 1200 miles lay through a *terra incognita.* Following these important additions to geography came the survey of Western Palestine by Lieut. Kitchener, R. E., in which he determined that the Sea of Galilee is 682 feet below the Mediterranean, while the Dead Sea is 1292 feet below it. Mr. T. Gardner in Trans-Caucasia, Capt. Lockwood in Eastern Persia, and Mr. E. Floyer, F. R. G. S., did good work, the last named conducting an expedition through Mekran, Bashkard, Persia, Kurdistan, and part of Asiatic Turkey. He penetrated with difficulty to Ahuran, the capital of Bashkard, a mountainous country before unexplored. The labors of the Russian military expedition on the Alai and Trans-Alai range, of which Col. Kostensko is the historian, form a record of the most difficult exploration in Asia, in the midst of extinct volcanoes, glaciers, and great mountains, resulting in the discovery of the important fact in Asiatic geography that there exists a chain of mountains running north and south, which Humboldt called the Bolor Mountains, but which heretofore was not credited generally.

But Col. Prejavalsky's explorations in Asia during the period under consideration have been the most famous, and rank with the achievements of Burton, Livingstone, and Stanley. His geographical labors in China and Mongolia were succeeded by his expedition to Lake Lob-nor, equipped by the Russian Geographical Society. His duty was to explore that vast and unknown region between Siberia, the Himalayas, China, and Turkistan. He went from Kulja, in Sungaria, by the valleys of the Tekis and Yuldus, to Kresla, crossing a pass of the Thian-Shan; and thence, after some delays, he passed southward, reaching Lake Lob-nor, being the first civilized traveller who has reached its shores since Marco Polo. He found the topography of the lake-valley and surrounding region very different from what it is represented in the map. He circumnavigated two-thirds of the lake in a boat, and discovered a mountain-range called Allyn Tan, rising to a height of 10,000 feet, and afterwards shot several wild camels. Wild camels are mentioned by Herodotus, but their existence has been doubted by many naturalists. In the neighborhood of Lob-nor he found the ruins of two old cities, and 120 miles south of the lake the Tarim River. Mongolia was contemporaneously explored by G. A. Polannin for the Russian Geographical Society, and Western Mongolia by Capt. Pevlsow; while the Rev. A. W. Nightingale in China made a journey up the river Han, and Mr. H. Cottam, a Ceylon merchant, endeavored to explore a new route overland from India to China. China, Burmah, Cambodia, and Siam were visited by explorers of note at this time—China by Lieut. Gill, R. E., in an important journey—and Dr. Harmand unearthed remarkable ruins in Cambodia. From May, 1878, to 1879 there was marked progress in Asiatic exploration. The English war with Afghanistan stimulating inquiry and enterprise, another course of the Brahmaputra was discovered, and the Sanpu, the great river of Thibet, was followed for 200 miles beyond Chetang. The work in China, Persia, and India was very valuable. Col. Grodekof in 1878 made a journey from Patta-Kissur to Herat, giving complete surveys and descriptions of the regions traversed.

Later Explorations.—Lack of space compels but a mere mention of the succeeding explorations down to 1883. Baron Amiroff, M. Yalvintseff, M. Slortsoff, M. Matthieu, M. Polannin, M. Oschanin, figured creditably in Northern Asia; Mr. J. Bryce among the

Armenians; Mr. C. Doughty in Arabia; Dr. Bastian in Persia; Lieut. St. George C. Gore in the Pishkin valley of Afghanistan; and Maj. Tanner in Kaffiristan. Count Szechenyo, an Hungarian, passed from China through Thibet. In China, Mr. G. J. Morrison, T. F. Brompton, the Rev. J. McCarthy, Mr. E. Colhore, and M. de Ujfalvy made separate and notable journeys. M. Ernst Oppert made three voyages to Corea, yielding much new information. Explorations in North-west India, Assam, the Malay Peninsula, and Cochin-China were also made. Mr. Delmar Morgan's travels in Central Asia, Mr. Colborne Baker's in China, and the hazardous journey of Mr. O'Donovan of the London *Daily News*, are recent and interesting explorations in Asia. But the most important fact in Central-Asian geography made known in later years has been determined by the Russian explorers,—that some parts of the great steppe lie below the level of the Caspian. (A. S.)

ASPERN, also **GROSS ASPERN**, a small village in Austria, on an arm of the north bank of the Danube, five miles E. N. E. of Vienna. It was a part of the ground, with Essling and Enzerzdorf, of a great battle fought in the brief campaign between France and Austria in 1809. The French were commanded by the emperor Napoleon, and the Austrians by the archduke Charles. The French call it the battle of Essling, which indeed is its proper name. After the preceding actions of Abensberg and Eckmühl, Napoleon had made a second entry into Vienna, and now occupied it on the 12th of May. Along the left bank of the Danube he was closely watched by the Austrian commander, who desired to draw him out and give him battle. He had also occupied two islands below Vienna, the larger of which was Lobau; from this he crossed the narrow belt of the Danube on the 21st of May, and occupied the three villages, Aspern, Essling, and Enzerzdorf. The first, consisting of low stone houses, was of the nature of a fortification; the second, which was filled with granaries, offered equal shelter; the third protected his right flank. When he had crossed 30,000 men to occupy these positions, he was fiercely attacked by the Austrians, numbering 80,000. The archduke carried both Aspern and Enzerzdorf on the right and left after hard fighting throughout the day, but Massena resisted his attacks and held Essling. During the night, however, the Austrians destroyed the principal bridge across the Danube, and the next morning assaulted Essling with overwhelming masses. Massena was driven out after such an obstinate defence as called forth the plaudits of the entire army. Already duke of Rivoli, he was created prince of Essling. The forecast which had secured the island of Lobau was now made manifest. The French crossed the narrow branch which separated it from the mainland on a pontoon-bridge covered by a *tête de pont* and a redoubt, and the whole army found shelter, rest, and means of reorganization. The fierceness of the battle is evidenced by the losses, that of the French being between 30,000 and 40,000. Among their killed were Marshal Lannes, duke of Monte Bello, and Generals d'Espagne, St. Hilaire, and Albuquerque. The French army engaged numbered 60,000; the Austrian, 100,000. After recruiting at Lobau, Napoleon recrossed to Essling on the 4th of July, and completely defeated the Austrians at Wagram on the 5th and 6th. This victory put an end to the campaign, and led to the treaty of Schönbrunn on the 14th of October, 1809. (H. C.)

ASPHALTUM, or **ASPHALT**. This term is frequently applied not only to the liquid bituminous substance obtained from certain limestones and sandstones, but to the various hydrocarbons, sometimes more or less oxygenated, composing the series embraced between naphtha and coal. Some authorities use the term "asphalt" to designate the rock producing bitumen, others use it as synonymous with bitumen, while another class employ it for the various compositions in which bitumen forms a more or less prominent ingredient.

See Vol. II. p. 625 Am. ed. (p. 715 Edin. ed.).

Asphalt rock, or *asphalt*, is a mineral containing from 87 to 93 per cent. of carbonate of lime and from 13 to 7 per cent. of bitumen, which is extracted by grinding or roasting the stone to powder and boiling. At a low temperature the stone is hard and sonorous, breaking with an irregular fracture; but as the temperature rises the stone softens, passing through various degrees of plasticity, until at from 140° to 160° it begins to crumble, and at 212° melts down. Its specific gravity is 2·235. Some rocks contain too much oil, which must be driven off by distillation before the mastic can be used. It is also found in the bituminous sand-rocks called *mollasse*, and in the volcanic rocks of Auvergne, where it is associated with other ingredients, as clay, silica, magnesia, and lime, with traces of arsenic.

Asphalt rock in its native condition forms an admirable material for roads or streets. It is prepared for this purpose by heating it to powder, which is compressed while hot in moulds of suitable dimensions, forming the blocks or *briquettes* used for paving; or the hot powder may be spread directly upon the surface and be compacted by hot rollers or pestles, thus forming a continuous stone covering. For sidewalks the asphalt rock is combined with bitumen (mineral tar) and grits. These ingredients are mixed at a temperature of 400°, as follows: First, the *mineral tar* is prepared by stirring together in an open boiler, at 470°, 85 pounds of Trinidad asphaltum and 15 pounds of "still bottoms," being the residuum obtained from the distillation of petroleum. Secondly, this compound is then mixed with the pulverized Val-de-Travers rock in the proportions of 98½ pounds of rock to 1½ of tar, and finally 98¾ pounds of this latter composition are mixed with 1¼ pounds of the mineral tar and 35 pounds of grits or pulverized limestone. Bitumen, which is the cementing material of asphaltic rocks, is frequently found separated from its matrix by natural forces. The most celebrated deposit of natural bitumen is that on the island of Trinidad, whence the United States obtains its chief supply. This pitch, however, is too sensitive to thermal changes to render its unalloyed use in northern latitudes entirely successful, but it is found that by mixing it thoroughly over a fire with "residuum" in the proportion by weight of 3 parts of the latter to 7½ or 8 of the former, the resulting mineral tar is equal to that of Seyssel. This, mixed with bituminous limestone, sand, or gravel, may be used for making a good *bituminous* or *asphaltic mastic*.

Numerous attempts have been made to produce an artificial asphalt by combining the principal ingredients, but they have generally been failures. The single exception of Jaloureau & Co. may be mentioned. Their product consisted of "coal tar heated to a degree that renders it hard and brittle, 25 parts; slaked lime in fine powder, 50 parts; river gravel, 75 parts." As yet, nothing of this description has been found equal to the asphalt obtained from the mines of Val-de-Travers in the canton of Neufchâtel, Switzerland, or of Pyrimont near Seyssel in the department of Ain, on the west bank of the Rhone, France. The former contains only pure limestone, mixed with from 9 to 13 per cent. of bitumen, and has been successfully used for more than fifty years in Paris, London, and other European cities, chiefly for pavements. Threadneedle Street, London, laid in May, 1869, has been subjected to a traffic of 200,000 tons per annum per yard of width, and is still in good condition. In July, 1879, a portion of Fifth Avenue, New York (from Twenty-sixth to Twenty-seventh Street), was laid with the same material to test its endurance; thus far it has proved satisfactory.

The mineral tar from the sand-rocks of Seyssel requires to be mixed with a harder asphalt to enable it to withstand exposure to sun in the United States. A paving-block manufactured by the Imperishable Stone Block Pavement Co., composed of mineral tar and broken limestone, has been extensively introduced in the principal cities of the United States, and has thus far given entire satisfaction.

Aside from its use as a material for pavements, whether as natural rock or in mastics, asphalt is used for a weather-coating or waterproof material for houses, cisterns, pipes, ships, etc., for medicine, for embalming, for mortar, and for many other purposes.

The utility of asphaltum was known to the ancients, but in modern times its value was shown by Eyrini d'Eyrinis, a Swiss physician of Russian birth living in the first half of the eighteenth century. He settled in the canton of Neufchâtel, where he taught Greek. In 1710 he discovered a mine of asphaltum in the Val-de-Travers, about which he published several pamphlets. At the same time he assigned his rights to the product of the mine to a Frenchman named La Sablonnière, who introduced the bitumen into France, but it was not generally introduced until about 1837, when Mr. Claridge of England obtained a patent for its application to roads and pavements, coverings for terraces, areas, roofs, etc. The result of its successful introduction into the arts produced an industrial fever almost unparalleled, which, however, soon reacted and left it almost as much neglected as before. Its use for terrace-coverings was described as early as 1827. (L. M. H.)

ASPHODEL, a pretty Liliaceous plant, native of the south of Europe, and one which has found a place in literature from the earliest times. Homer uses the word *asphodelos* in the *Odyssey*, but it is rather in connection with a meadow as a whole than with the flowers which compose it: its derivation is uncertain. It is a pretty plant, but will not compare in beauty with numerous other members of the Liliaceous tribe. Like so many of the family, it has narrow, fleshy, grass-like leaves, and throws up a stem several feet in length, terminating either as a single spike or branching panicle of white or yellow flowers, each flower forming a perianth of six divisions, as usual in the Lily family, and about an inch or more across. The roots are fleshy, of the color and form of small sweet potatoes. It is botanically known as the *Asphodelus ramosus* of Linnæus. The roots are edible when cooked, having much the character of asparagus, and were in much demand in ancient times; but they have wholly fallen into disuse. In early funeral ceremonies, of which placing food in the coffin formed a part, Asphodel roots were employed in the case of a distinguished person. The medical properties were early known. It is strongly diuretic, and Hippocrates, the father of medicine, who flourished some four hundred and sixty years before Christ, notes it as being of great value in the treatment of obstinate ulcers. Pliny, the great Roman writer on natural history, gives in his twenty-first book a long account of its many virtues and uses. He refers to it as *Asphodelum hastulam regiam*, which is evidently the origin of the common English name of the plant, "the king's spear," by which it is known in gardens. It has a place in mythology. When Paris the shepherd gave his judgment in favor of the beauty of Venus, and the irate Juno and Pallas fell on him therefor, his shepherd's crook was broken, and from the pieces the Asphodel arose. Some writers, but without much warrant, identify the Asphodel with the narcissus (*Narcissus poeticus*) or daffodil (*Narcissus pseudo-narcissus*). It is said to grow in immense profusion in some of the districts of Southern Italy, serving now, as in the most ancient times, an excellent purpose as pasture for sheep. An allied plant, *Narthecium Americanum*, is known in American botany as Bog Asphodel. It grows in sandy places along the Atlantic coast from New Jersey southward. (T. M.)

ASPROMONTE, a mountainous elevation in Calabria, near Reggio, 7000 feet high, covered with forests. It is the eastern part of the Mons Silla of the ancients. In the summer of 1862, Garibaldi, who had been appointed a general in the national guard, crossed from the island of Caprera to the mainland with 2200 men. He first directed his march upon Reggio, but was obliged to fall back upon Aspromonte, after an ineffectual resistance; he was there wounded in the foot, and made prisoner by Col. Pallavicini. His son Menotti was taken with him. The action occurred on the 22d of August, 1862. After his capture he was taken to Spezzia, and then to Pisa, where he lay ill for some time. It was long feared that his wound would necessitate the amputation of his leg, but through the skill and attention of Dr. Nélaton of Paris it was saved. (H. C.)

ASSAPAN, a name applied to the North American flying squirrel (*Sciuropterus volucella*), shortened from *assapanick*, which occurs in the same application in early historical works relating to America, as Smith's *Virginia* (1606), etc. It has been adopted by Cuvier and other naturalists, and is still used to some extent. (See SQUIRREL.) (E. C.)

ASSETS (derived from French *assez*, old Norman-French *assetz*, enough). It originally signified a sufficiency of property in the hands of an executor to satisfy the debts of a decedent, but this meaning is now obsolete. In its common acceptation at the present time it denotes all the property, real and personal, of an individual or corporation liable for the payment of debts or other obligations. In its more restricted legal sense it is defined as "all the property in the hands of an heir, executor, administrator, or trustee which is legally or equitably chargeable with the obligations required to be discharged by the heir, executor, administrator, or trustee as such." The following distinctions are recognized: (1) *Assets entre mains* (assets in hand), property immediately in possession of an executor or trustee for the purpose of satisfying claims against him as such; (2) *equitable assets*, which can be reached only by intervention of a court of equity, and which must be divided *pari passu* among all creditors; (3) *legal assets*, liable for debts according to legal priority; (4) *assets per descent*, ancestral estate descending to heir, chargeable, *pro tanto*, with the specialty debts of such ancestor; (5) *personal assets*, personal property to which the executor or administrator is entitled; (6) *real assets*, such as descend immediately to the heir.

In the United States generally, by statute, all property, real and personal, belonging to a deceased person is liable in equity for the payment of debts and claims against his estate, in the following priority (unless altered by State law): (1) Personal estate not specifically bequeathed; (2) real estate devised for the payment of debts; (3) real estate descended, but uncharged; (4) real estate devised, charged generally with payment of debts; (5) general pecuniary legacies, *pro rata;* (6) real estate devised, not charged with debts.

If the assets are in several funds, access to all of which is possible only to certain creditors, courts of equity authorize the *marshalling* of the assets—*i. e.*, they compel the favored creditors to exhaust first the fund to which they have exclusive right, or, if they are satisfied without this, permit the others to occupy their place. If after assets are exhausted a creditor sues an executor or administrator, the latter may plead *plene administravit*, and judgment be given for plaintiff against assets *in futuro*.

See Vol. II. p. 637 Am. ed. (p. 729 Edin. ed.).

ASSIGNMENT (Law Latin *assignatio*, from *assigno*, to mark for, appropriate to), in law, the transfer or making over of property by one person to another. The word is used generally as to transfers of personal property, just as the word *conveyance* is used as to transfers of real estate; but technically the word was formerly more particularly applied to the transfer of the unexpired portion of a term or estate for life or years. The proper technical words in an assignment are "assign, transfer, and set over," but any words which clearly show the intent of the parties to make a complete transfer are sufficient. It is not essential to a valid transfer of personal property that a formal instrument should be executed, as in the transfer or conveyance of lands. Such an instrument, however, is frequently used, and is known as a *bill of sale*. Generally, the transfer of personal property is made by a brief note or memorandum, and in some cases, by the law merchant, merely by indorsement, as in the case of promissory notes and bills of exchange, which, when negotiated (by being made payable to order), become transferable by indorsement, and in the case of the cargo of a vessel or goods in a warehouse, which may be transferred by the indorsement of the bill of lading or of the warehouseman's receipt.

An assignment for the benefit of creditors is the transfer by a debtor of all his property to a trustee (who is called the *assignee*) in trust for his creditors. The primary object of such assignments is to secure the equitable distribution of the property of an insolvent debtor among his creditors. But in this country that object has not been attained except through the operation of a national bankrupt law, because such assignments are necessarily regulated by statute in the different States of the Union, and no uniformity in the legislation relating to them has ever been secured. In many of the States such an assignment is merely the voluntary act of the debtor, and no provision is made for the compulsory surrender by an insolvent of his property for distribution among his creditors; while in many of the States, also, preference of one creditor over another is permitted. With a national bankrupt law in force an entire uniformity in this respect would exist, and equal rights be secured to all creditors, the operation of the various State laws relating to assignments for the benefit of creditors being virtually suspended. The necessity for such uniformity in the present extended inter-communication between the different States in mercantile affairs forms one of the strongest arguments in favor of a national bankrupt law. (S. W.)

ASSINIBOINS, a tribe of American Indians of the Dakota family resident in Montana Territory, from which they extend northward into British America, where they inhabit the valley of the Assiniboin River. They originally formed a part of the Yankton Sioux, from whom they separated, in consequence of a quarrel, early in the seventeenth century. Since then hostilities have continued between them and the Sioux, who still call them Hoha, or rebels. The Assiniboins were first known in the sixteenth century, when they were visited by the enterprising French missionaries. At this period they were numerous and powerful. The portion of the tribe in British America is divided into two sections, the Prairie and the Wood Assiniboins. The former are active, energetic, and predatory; the latter are among the poorest and most wretched of Indians. The total number in British America is estimated at about 5000. Several missions have been established among them by the Roman Catholic and Methodist churches. Those in the United States are divided into bands, known as the Red Stone and the Upper Assiniboins. Their numbers in the United States are estimated at something less than 5000. This is a very great decrease from the estimated number of the Assiniboins a century ago. They continue quite uncivilized, living by the chase and showing no tendency to a settled mode of life.

ASSOCIATE PRESBYTERIAN CHURCH IN THE UNITED STATES. Among the Scotch and Irish immigrants that settled in the valley of the Susquehanna in Pennsylvania were many families that adhered to the Secession churches of Scotland. In answer to their repeated petitions for a missionary, the Associate (Antiburgher) Synod of Scotland ordained and sent out in the summer of 1753 the Rev. Alexander Gellatly. The Rev. Andrew Arnot of Midholm came with him to assist for a year in the work of organization. On Nov. 2, 1753, in Lancaster co., Pa., these two missionaries, with one or more ruling elders, organized themselves into the "Associate Presbytery of Pennsylvania," subordinate to the Associate (Antiburgher) Synod of Scotland. Mr. Gellatly settled at Middle Octorara, and in 1754, Rev. James Proudfoot followed and settled at Pequea; in 1758, Rev. Matthew Henderson came and settled at Oxford; Rev. John Mason came in 1761, and settled in New York City; and others soon followed. Congregations were quickly organized in Pennsylvania within the bounds of the present counties of Lancaster, Chester, York, Adams, Cumberland, Franklin, and Juniata; in New York in the counties of Orange and Washington; and in the cities of Philadelphia and New York. On May 20, 1776, the Presbytery of New York was organized as co-ordinate with that of Pennsylvania. All the ministers of the Associate and of the Reformed or Covenanter churches sympathized with the colonies in their revolt against Great Britain, and in 1777 began to negotiate among themselves for a union, so as to form an American Church adhering to the principles and government of the Scottish dissenters, but independent of all foreign organizations. Such a union was consummated in June, 1782, and gave rise to the Associate Reformed Church. But Rev. William Marshall of Philadelphia and Rev. James Clarkson of York county were not satisfied with part of the basis, and with three elders protested against the union and continued the organization of the Associate Presbytery of Pennsylvania. They were soon joined by other ministers from Scotland. Rev. Robert Armstrong and Rev. Andrew Fulton, missionaries to Kentucky, organized Nov. 28, 1798, the Presbytery of Kentucky. In Philadelphia, May 20, 1801, the Associate Synod of North America was organized, and its ministers and congregations distributed into the four presbyteries of Cambridge for New York and Vermont; Philadelphia, for Eastern Pennsylvania; Chartiers, for Western Pennsylvania; and Kentucky, for the far West. The Church grew rapidly, mainly by the arrival of emigrants from Scotland and Ireland. The early ministers were all from Scotland, but in number they were insufficient to supply the demand, and the necessity of a home-supply was recognized. Therefore, on April 21, 1794, the Associate Presbytery of Pennsylvania resolved to establish a theological seminary, and elected as its first professor the Rev. John Anderson, D. D., of Service, Beaver co., Pa. A two-story log house was erected near to his residence for the accommodation of the students, and a library of 800 volumes was collected. This was the first regularly organized theological seminary in the United States, with its regular professor, library, course of study, and boarding-hall. This seminary was subsequently moved to Canonsburg, Pa., and later still to Xenia, Ohio, where it still exists. The Associate Church always insisted upon a thoroughly educated ministry, requiring a four years' theological course to follow a regular college training. At first the synod was regarded as being subordinate to the General Associate Synod of Scotland, and the right of appeal from the one to the other was recognized; but the impossibility of carrying out this arrangement led to a change in 1818, when the two synods were made co-ordinate. The Church here had the same standards as the mother-Church—viz., the Westminster Confession of Faith, the Catechisms, Larger and Shorter, the Form of Church Government and Directories for Worship of the Church of Scotland, and a judicial testimony. This testimony was altered in 1784 by the Presbytery of Pennsylvania, so as to make it more suitable to the circumstances of the times and the surroundings in this country. The Church always insisted upon a faithful and exact adherence to its formulated doctrines, and required the same assent from private members as from officers, limited only by different degrees of intelligence and capabilities of understanding. It was also rigid in the administration of its discipline. The synod at its organization issued a warning against the moral evil of slaveholding, and in 1811 declared it to be a moral evil to hold negroes in bondage, and directed its members to set them at liberty, or, if this could not be done according to the laws of the State, to treat them as if free in respect to food, clothing, instruction, and wages. All this accomplished but little good; so in 1831 a stringent act was passed which practically excluded slaveholders from the communion of the Church. The result was the extinction of this body in Kentucky, and the withdrawal of the Presbytery of the Carolinas, with all the congregations in Virginia and North and South Carolina, leaving two in Tennessee and one in Maryland as the only ones in slave territory. In 1840 the synod issued a warning against the traffic in ardent spirits, and at various times took higher and higher ground, until in 1857 all who manufactured or sold intoxicating liquors as a common beverage were denied membership. From the first and always, those connected with secret and oath-bound societies were excluded from her communion. In New York State a difficulty, more of a personal than of a doctrinal character, which had been festering for nine or ten years, culminated in 1840 after a number of ministers had been suspended. These exscinded pastors, with their adherent congregations, organized themselves into the Presbyteries of Albany, Cambridge, and Vermont, and the Associate Synod of North America. This schism continued until 1854, when the two synods were happily united. In 1843 foreign missionary work was undertaken, and a mission was established in the island of Trinidad, but as it did not succeed well, it was in a few years transferred to the Free Church of Scotland. Another mission was located in 1854 in the Punjaub in Northern India: this succeeded well, and is still prosperous. As early as 1820 an effort was made towards a union with the Associate Reformed Church, and, although unsuccessful, the matter was still kept in mind, and renewed in 1840. Annual conventions were held for a number of years for the formation of a basis of union; the work progressed very slowly, but terms were finally agreed upon, and the union was consummated on the 26th of May, 1858, in Pittsburg, Pa., and the new organization was styled the "United Presbyterian Church of North America." A residue consisting of 11 ministers, 32 congregations (generally very small), and 778 members declined going into the union, and maintained the organization of the Associate Synod. It still exists, but without any material increase. A monthly magazine is published in its interest, called *The Associate Presbyterian*. Previous to 1858, the Associate Church had spread itself into nearly all the non-slaveholding States, but as this was much more by migration than by aggression, its membership was everywhere mainly confined to those of Scotch or Irish ancestry. At the date of the union the synod consisted of 21 presbyteries, 198 ministers, 33 licentiates, 293 congregations, 16,620 families, and 23,500 communicants. (J. B. S.)

ASSOCIATE REFORMED PRESBYTERIAN CHURCH. This organization resulted from the union of the Associate Presbyterian and the Reformed Presbyterian churches, which were popularly known as the Seceders and Covenanters. The Associate Presbytery of Pennsylvania was organized Nov. 2, 1753, and the Associate Presbytery of New York, May 20, 1776. The Rev. John Cuthbertson landed in America Aug. 5, 1751, as a missionary from the Reformed Presbyterian Presbytery of Scotland to the Covenanters, who were located principally in Eastern Pennsylvania. Being joined by the Rev. Matthew Lind and Alexander Dobbin, they organized at Paxtang, Dauphin co., Pa., March 10, 1774, the Reformed Presbyterian Presbytery of North America. The revolt of the colonies and their struggle for independence suggested the desirableness of a united American Church holding the doctrines and customs of the Scottish dissenters. Negotiations began in 1777, which resulted in the adoption of a basis of union—in the spring of 1780 by the Presbytery of New York; on Dec. 1, 1781, by the Reformed Presbytery; and on June 13, 1782, by the Presbytery of Pennsylvania. These three presbyteries met in convention in Philadelphia, Oct. 30, 1782, and on the next day formally organized the Synod of the Associate Reformed Church. The basis of union contained ten propositions, four of which referred to the origin and administration of civil government. To formulate these had been the work of years, while those that referred to the doctrines of grace were easily agreed upon. The synod at its first meeting adopted eight articles "to display the principles" upon which the Church intended to act, and these were familiarly known as the "Little Constitution." The complete standards were not agreed upon until 1799, and they consisted of the Westminster Confession of Faith, with some alteration of the articles defining the power of the civil government in relation to religion, the Larger and Shorter Catechisms, together with the Government and Discipline of the Church and the Directories for Public and Private Worship. These were declared to be the "fixed testimony" of the Church, and provision was made for the emission of "occasional testimonies" from time to time as circumstances might require. At first there were three presbyteries, and others were erected as needed. In 1786 the Londonderry was organized in New England, but in 1793 it coalesced with the "Independent Presbytery of the Eastward," and in 1801 became independent itself. The Church grew rapidly wherever there were Irish or Scotch immigrants, until from territorial extension it became inconvenient to meet annually in one aggregate synod. So in 1803 the provincial synods of New York, Pennsylvania, Scioto, and the Carolinas were organized, subordinate to a general synod of delegates from all the presbyteries, which held its first meeting in May, 1804. In 1801 it was resolved to establish a theological seminary with a more complete organization and a more extensive course of study than anything yet attempted in this country. It began operations in the autumn of 1805 in New York City, with eight students, under the direction of the Rev. John M. Mason, D. D., and soon became celebrated, so that many students from other denominations sought its instruction. In 1821 its operations were suspended, but they were resumed in 1829, at Newburg, N. Y. The general synod worked well for a short time, but its place of meeting was in Philadelphia, and delegates from distant places, who had to travel on horseback, could not always be present; so its power gradually centralized in a few near the place of meeting, whose actions did not command universal satisfaction. In 1820 the Synod of Scioto declared itself independent, and was organized as the Associate Reformed Synod of the West. In 1821 the Synod of the Carolinas was permitted to withdraw and organize as the Associate Reformed Synod of the South. The general synod of the remainder formed in 1822 a partial union with the Presbyterian Church, which absorbed or disorganized the Synod of Pennsylvania, while the Synod of New York continued as the legal heir of the general synod, and was so recognized by the court of chancery in New Jersey when it in 1837 decreed the transfer to Newburg, N. Y., of the Associate Reformed library and funds, which had been removed to Princeton. Thenceforth the three synods existed as independent but co-ordinate bodies, which recognized the family relationship. The Synod of the South provided for itself a college and theological seminary at Due West, Abbeville district, S. C., which have done, and are still doing, good service for the Church and the community. A weekly newspaper called *The Associate Reformed Presbyterian* is published at the same place. The synod has widened its field of operation, having now congregations from Virginia to Texas, and in 1881 reported 9 presbyteries, 81 ministers, and about 7000 communicants. It still remains independent, but has under consideration the subject of union with the United Presbyterian Church. In addition to the cultivation of its wide and needy home-field, it maintains a missionary in Egypt and another in Mexico. When the Synod of New York became independent it waked to new life and activity. It reopened the theological seminary in 1829 at Newburg; established in 1831, at Geneva, N. Y., the *Christian Magazine* as a Church organ; sent out in 1835 two missionaries to India, and subsequently six others to Syria. Its progress was gradual, but steady. In 1855 a union was consummated with the Western division upon the basis of their common standards, and a general synod of North America was thus established. It brought to the new organization 6 presbyteries, 58 ministers, 48 congregations, 7700 members, 1 theological seminary, and several foreign missionaries. When the union with the Associate Church was made in 1858 a few ministers and congregations protested, and continued in New York a residuary synod which has become extinct. When the Associate Reformed Synod of the West was organized in 1820 as an independent body, it was composed of the three presbyteries of Monongahela, Ohio, and Kentucky. The prospects in Kentucky were very good, but some mismanagement and the growing slavery controversy retarded progress, and finally excluded the Church from that State. A theological seminary was established in 1825 in Pittsburg, and another in 1839 at Oxford, Ohio, and a system of home missions was instituted which did a good work in the new settlements of the West. The ministers were energetic and laborious, and as the field was the new and growing part of our country, the Church increased rapidly. In 1839 it was divided into two synods, and soon afterward into three, subject to a general synod. Its exclusion of slaveholders from its communion restricted its operations to the free States. It also excluded all manufacturers or sellers of intoxicating liquors to be used as a beverage, and all members of secret oath-bound societies. In 1844 it entered heartily into the foreign missionary work, and established a mission at Damascus in Syria, and subsequently others at Alexandria and Cairo in Egypt. In 1855 it was united with the Synod of New York, and this enlarged body united in 1858 with the Associate Synod and formed the present United Presbyterian Church of North America, bringing as its contribution 240 ministers, 360 congregations, and 30,000 communicants; also, 3 theological seminaries, 10 foreign missionaries, and 3 religious periodicals. (J. B. S.)

ASSOS, an ancient Greek city of Asia Minor, situated in Mysia, on the Gulf of Adramyttium. It has no prominence in history; it was the birthplace of Cleanthes the Stoic philosopher, and is mentioned in the New Testament (Acts xx. 13). In modern times it has frequently been visited by travellers, and Col. Leake says that the view of its site "gives perhaps the most perfect idea of a Greek city that anywhere exists." The Archæological Institute of America, formed in 1879, being desirous of carrying on work in classical lands as well as in their own country, organized an expedition under the direction of Joseph T. Clarke, an accomplished architect of Boston, and selected Assos as a suitable place for excavations, hoping to enlarge our knowledge of Greek architecture. F. H. Bacon, another Boston architect, was associated with Mr. Clarke in the work, and their success has been beyond their expectations.

The acropolis, 800 feet high, is surrounded on all sides, except the north, by an irregular plateau, on which the city stood. The sloping ground at the base was carefully terraced with heavy retaining walls, which sustained the chief public buildings of the city. A huge mole protected the harbor, from which the ascent was by a steep winding road. The temple which crowned the summit is of special interest in the history of the development of the Doric style; the remains of the buildings in the agora of the ancient city, including stoa, portico, gymnasium, baths, theatre, etc., are unique in character. The walls afford an example of Greek works of fortification unrivalled in extent and in construction, while the Street of Tombs exhibits an important series of sarcophagi and sepulchres. The city was, in fact, virgin soil for the archæologist, although the temple had been described, but most inaccurately, by Texier, a French architect, in his work on Asia Minor, and various sculptures taken from its ruins in 1838 are among the most valuable treasures of the Louvre. Mr. Clarke succeeded in obtaining the complete elevation and plan of the temple and in rescuing many valuable sculptures. He also discovered numerous important inscriptions, several mosaic pavements, and the piers of an unique stone bridge of Greek construction over the river that runs through the plain beneath the city.

The best account of Assos and a full description of the temple, as recovered by the American expedition, are contained in *Papers of the Archæological Institute of America*, Classical Series I.: Papers on the Investigations at Assos, 1881; with 44 plates and maps (Boston, 1882). The investigations will be brought to a close in 1883.

See Vol. II. p. 643 Am. ed. (p. 745 Edin. ed.).

ASTER is almost exclusively an American genus, for although several are found in Russia, Germany, England, and Japan, the most of the some 200 admitted species are natives of the American continent. There are about fifty species in the Atlantic portions of the United States, about a dozen in California, perhaps as many more scattered through the mountains of South America, and a considerable number peculiar to the mountain-chains which divide the continent. Many are wholly northern, and some extend to the shores of the Arctic Ocean. It is by no means an alpine genus, yet many grow at an altitude of 8000 or 9000 feet, and one, *Aster glacialis*, has been found at 12,000. It is difficult to give the exact number of species, as the genus is regarded as a very complicated one. Large numbers, once referred to it by some botanists, have been disposed elsewhere by others; and again the distinct genera of some botanists considered as *Asters* by others. Thus, *Machæranthera*, a genus recognized by many as distinct from *Aster*, inhabiting the dryer regions of the United States, and presenting a habit different from *Asters* as generally known, is classed in the genus by many modern authors. They are so numerous, and many of the species so abundant, as to give a peculiar character to the American floral scenery. Some species or other may be found in flower almost any time from early summer till severe frosts destroy them in the fall of the year. There are few, even among the young or most indifferent, who do not know an aster, and the name is common in literature.

It is remarkable that so extensive a genus should present no character beyond its beauty to commend it to the service of man. (T. M.)

See Vol. II. pp. 643, 705 Am. ed. (pp. 736, 806 Edin. ed.).

ASTEROIDS, called also PLANETOIDS, MINOR PLANETS, ULTRA-ZODIACAL PLANETS, etc., are a very extensive group or family of small planets revolving around the sun between the orbits of Mars and Jupiter. The most striking peculiarity of these bodies is their excessive minuteness as compared with those called "major planets." Except the satellites of Mars, they are by far the smallest circumsolar bodies known. They present no discs, even with the largest telescopes and with highest powers, and hence the impossibility of measuring their diameters or even of estimating them by any process known to astronomers. Many of their orbits cross and re-cross each other in such a manner as to suggest frequent near approaches, if not actual collisions.

Various theories have been promulgated to account for the existence of such a large number of small planets where, to complete the harmony of planetary distances, there should be but one, and that, probably, a large one.

The fact that this zone of planets, with periodic times so nearly alike, should exist between the small planet Mars on the one side and the giant Jupiter on the other, has been thought by some to be a significant one, and also to favor the truth of the nebular hypothesis.

As their orbits extend over a zone of only 250,000,000 miles, it follows that the periodic times of many must be nearly identical, or, in other words, the length of their years can differ but a few days or even hours. The two most nearly equal are 75 Eurydice and 77 Frigga = 4·37 earths = 1, which differ but a very few hours. The smallest semi-axis major of orbit (or mean distance) is 149 Medusa = 2·2 = 203,500,000 miles = 3¼ years. The largest is 153 Hilda = 3·954 = 365,745,000 miles = 7·86 years. The one most inclined to the ecliptic is 2 Pallas = 34° 42′; the least, 20 Massilia = 0° 41′ 7″. The most eccentric is 132 Æthia = 0·380; the least, 110 Lomia = 0·023. The brightest, and probably the largest, is 4 Vesta = 6·6 magnitude, which at opposition can be seen with the naked eye.

Mythological names were, until recently, given them by their discoverers, but the list being nearly exhausted, other and more modern appellations are being bestowed upon them, which appears to be an improvement. An examination of the catalogue will show that the vagaries of mythology have been sufficiently honored.

The number of undiscovered asteroids is, undoubtedly very great, perhaps amounting to thousands. It is to be hoped, however, that this is not the case, or if so they will for ever remain unknown, as the time and patience of astronomers are even now taxed beyond endurance to keep track of those already known. Notwithstanding this watchfulness, some have been lost.

The symbol used to designate them is a small circle with the number of the planet in the order of discovery inserted therein; thus, ⑩, (100), (210), represent, respectively, Hygeia, Hecate, and Isabella.

The following is a continuation of the list from Vol. II. p. 706 Amer. ed. (p. 807 Edin. ed.), and includes all known to date:

No.	Name.	Discoverer.	No.	Name.	Discoverer.
144	Vibilia.	Peters.	184	Deiopeia.	Palisa.
145	Adeona.	Peters.	185	Eunike.	Peters.
146	Lucina.	Borelly.	186	Celuta.	Prosper Henry.
147	Protogenia.	Schulhof.	187	Lamberta.	Coggia.
148	Gallia.	Prosper Henry.	188	Menippe.	Peters.
149	Medusa.	Perrotin.	189	Phthia.	Peters.
150	Nuwa.	Watson.	190	Ismene.	Peters.
151	Abundantia.	Palisa.	191	Kolga.	Peters.
152	Atala.	Paul Henry.	192	Nausicaa.	Palisa.
153	Hilda.	Palisa.	193	Ambrosia.	Coggia.
154	Bertha.	Prosper Henry.	194	Procne.	Peters.
155	Scylla.	Palisa.	195	Eurycleia.	Palisa.
156	Xantippe.	Palisa.	196	Philomela.	Peters.
157	Dejanira.	Borelly.	197	Arete.	Palisa.
158	Coronis.	Knorre.	198	Ampella.	Borelly.
159	Æmilia.	Paul Henry.	199	Byblis.	Peters.
160	Una.	Peters.	200	Dynamene.	Peters.
161	Athor.	Watson.	201	Penelope.	Palisa.
162	Laurentia.	Prosper Henry.	202	Chryseia.	Peters.
163	Erigone.	Perrotin.	203	Pompeia.	Peters.
164	Eva.	Paul Henry.	204	Callisto.	Palisa.
165	Loreley.	Peters.	205	Martha.	Palisa.
166	Rhodope.	Peters.	206	Hersilia.	Peters.
167	Urda.	Peters.	207	Hedda.	Palisa.
168	Sibylla.	Watson.	208	Lacrimosa.	Palisa.
169	Zelia.	Prosper Henry.	209	Dido.	Peters.
170	Maria.	Perrotin.	210	Isabella.	Palisa.
171	Ophelia.	Borelly.	211	Isolda.	Palisa.
172	Baucis.	Borelly.	212	Medea.	Palisa.
173	Ino.	Borelly.	213	Lilaea.	Peters.
174	Phædra.	Watson.	214	Aschera.	Palisa.
175	Andromache.	Watson.	215	Œnone.	Knorre.
176	Idunna.	Peters.	216	Cleopatra.	Palisa.
177	Irma.	Paul Henry.	217	Eudora.	Coggia.
178	Belisana.	Palisa.	218	Bianca.	Palisa.
179	Clytemnestra.	Watson.	219	Thusnelda.	Palisa.
180	Garumna.	Perrotin.	220	Unnamed.	Palisa.
181	Eucharis.	Cottenot.	221	Unnamed.	Palisa.
182	Elsa.	Palisa.	222	Unnamed.	Palisa.
183	Istria.	Palisa.	223	Unnamed.	Palisa.

By an inspection of the entire catalogue we learn that sixty-nine, or nearly one-third of the whole number, have been discovered in the United States. In this field Dr. Peters ranks highest in the world, having found forty-one. Next comes Palisa with thirty-two, followed by Watson with twenty-two, Luther with twenty, and Goldschmidt with fourteen, etc., etc. The process of searching for these minute points of light is a laborious one, and reflects great credit upon the diligence and zeal displayed by those who have made their systematic and protracted search a specialty. (L. S.)

ASTIE, Jean Frédéric, a French Protestant minister and author, was born at Nérac, in 1822. After studying theology he removed to the United States, and was for some years pastor of a French congregation in New York. He afterwards became professor of philosophy at Lausanne, Switzerland, where he still remains. Among his numerous works, philosophical, religious, and historical, are the following: *M. Scherer, ses Disciples et ses Adversaires* (Lausanne, 1854), *Le Réveil religieux des États-Unis, 1857–58* (1859), *Les deux Théologies nouvelles dans le Sein du Protestantisme français* (1862), *Histoire de la République des États-Unis, 1620–1860* (1865), *Théologie allemande contemporaine* (1874), *Mélanges de Théologie et de Philosophie* (1878), *Les Évolutions de M. Bersier et sa Morale utilitaire* (1878), *L'Opportunisme et l'Intransigeance* (1878), *La Genève de l'Avenir* (1880), *L'Orthodoxie et le Libéralisme* (1880), *La Crise théologique et ecclésiastique* (1881). He has also published a commentary on the Gospel of St. John, editions of the *Pensées* of Pascal, and selections from Vinet, with an essay on *Le Vinet de la Légende et celui de l'Histoire* (1882). He assisted in founding the *Revue de Théologie et de Philosophie* at Lausanne in 1867, and has since been one of its editors. Prof. Astie represents the moderate orthodoxy of French Protestantism, in opposition to the liberal or rationalist school, of which M. Scherer was the chief representative until he abandoned theology for pure literature.

ASTORIA, the county-seat of Clatsop co., Or., is on the south bank of the Columbia River, 15 miles from its mouth. It is 105 miles by water from Portland and 560 miles N. of San Francisco. It has a U. S. custom-house built of stone, two hospitals, six hotels, a bank, a daily and a weekly newspaper, eight churches, and six schools. Its most important industry is canning the salmon caught in the Columbia River, in which business twenty firms are engaged. It has also two iron-foundries, three saw-mills, and three box-factories. Besides the custom-house and hospitals, it has several fine buildings, including the Odd-Fellows' Temple, the Masonic Hall, and the Knights' Temple. Its property is valued at $1,203,000; its public debt is $22,500, and its expenses for 1881 were $15,559. Astoria was settled in 1811 by the enterprise of John Jacob Astor of New York. Its early history has been fully recounted by Washington Irving in his volume on *Astoria*. It was incorporated in 1872 as a town, and in 1876 as a city. The inhabitants are chiefly of American birth. Population, 2803.

ASTROLABE, an ancient astronomical instrument, called also **Armillary Sphere**, for determining the positions of celestial bodies, invented by Hipparchus, and improved and successfully used by Tycho Brahe. Though it varied in form, it mainly consisted of three or more circles graduated to degrees, one of which was placed parallel either to the ecliptic or to the equator, as desired. To this, and at right angles with it, was firmly attached another, which of course pointed either to the poles of the ecliptic or to the equator, depending on the setting of the first. Another represented the meridian, and still another, a sort of movable one, which could be directed east or west of the meridian. When the instrument was set, it was in every sense an equatorial, and by means of sights an observer could roughly determine the place of any celestial object visible to the naked eye. By its use Hipparchus, more than a hundred years before the Christian era, ascertained the latitude and longitude of 1080 stars, all that were visible above his horizon. This capital achievement has in many ways been of great service to astronomy, notably in determining the value of the constants of precession and variation of the obliquity of the ecliptic. It was, in fact, with this rude instrument that he discovered the phenomenon of the precession of the equinoxes, for after he had fixed the positions of the points where the sun crossed the equator in his journey from south to north—technically called the vernal equinox and also the first point of Aries—and from north to south, or the autumnal equinox, he was surprised to find that they did not agree with those determined by astronomers one hundred and fifty years before. After careful and long-continued watching, he ascertained that the equinoctial points had a slow progressive motion to the west. The mean amount of this motion is only 50·2″ annually. As the circle of the sky, like every other circle, contains 1,296,000″, this number, divided by 50·2 = 25,816, the number of years required for them to complete the circuit of the sky and be again found where they were in the days of Hipparchus.

Modern instruments of far greater precision, such as the quadrant, sextant, and especially the equatorial telescope with its micrometer and finely-graduated circles, have entirely superseded the astrolabe, which is now seen only as a curiosity in museums. (L. S.)

ATAMASCO LILY (*Amaryllis* or *Zephyranthes Atamasco*) is the only representative on the American continent of a large genus of African bulbous plants well known under cultivation, and serves as the type of the natural order *Amaryllidaceæ*, distinguished from true Lilies (*Liliaceæ*) chiefly through the perianth being adherent to the ovary (perianth superior), while it is free (ovary superior) in *Liliaceæ*. It is a small bulbous plant, with narrow grass-like leaves, and flowers about the size of a large crocus, terminating in a scape about four or six inches high, which are of a delicate rosy color, and appear very early in spring. A paler, almost white, form, with still narrower leaves, has recently been discovered in Florida by Mrs. Mary Treat, and named *Amaryllis Treatæ*. (T. M.)

ATCHISON, the county-seat of Atchison co., Kan., is on the W. side of the Missouri River, 20 miles S. W. of St. Joseph. It is the terminus of nine railroads —the Atchison, Topeka, and Santa Fé Railroad, the Central branch of the Union Pacific Railroad, the Missouri Pacific Railroad, the Missouri Pacific-Nebraska Railroad, the Atchison and Nebraska Railroad, the Kansas City, St. Joseph, and Council Bluffs Railroad, the Chicago, Rock Island, and Pacific Railroad, the Chicago. Burlington, and Quincy Railroad, and the Hannibal and St. Joseph Railroad. An iron railway- and highway-bridge spans the Missouri River at this point. The city has a court-house, two national and four private banks, three daily and five weekly newspapers, thirteen churches, five public schools, three colleges, an abbey of the order of St. Benedict, and a public library. Among its industrial establishments are three flour-mills, a linseed-oil mill, a tow-mill, the machine-shop of the Chicago, Burlington, and Quincy Railroad, and the Atchison and Nebraska repair-shops; manufactories of carriages, furniture, barrels, wagons, doors, and crackers, fruit-canning works, a brewery, two large pork-packing establishments, and six grain-elevators. The city is lighted with gas, and has good waterworks and a street railway. It was settled in 1854 and incorporated in 1855, and is surrounded by a hog- and grain-producing district. Its property is valued at $2,200,000, and its population, chiefly of American birth, is 15,105.

ATHABASCAN INDIANS, a title given to a large linguistic family of Indian tribes from Lake Athabasca in British America, which is in their territory. They are also called Tinné, Tinneh, or Tinney, which in some of their dialects signifies "people." There are two great divisions of the Athabascans, widely separated in locality and character, but united by their languages, which seem derived from one common stock. One division lives in the northern regions of British America and Alaska, and occupies a territory of great extent, reaching from Hudson Bay to the Pacific, and bordered on the north by the country of the Esquimaux, and on the south by the Churchill River and the territory of Algonkin tribes. The second division borders on the Mexican frontier, and extends from the Gulf of California to Texas. It embraces the Apache, the Navajo, and the Lipan Indians, numbering about 17,000. In addition to these are many bands on the Pacific, from Cook's Inlet to Umpqua River, Or. The Tinneh of Alaska, according to the census of 1880, number but 4737. Dall enumerates some twenty tribes or bands.

The northern division embraces many tribes, of whom the most important are the Tinné or Chippewyans, the Tahkali, the Strongbows, Sheep, Hares, the Kutchin, the Dog Ribs, the Slaves, the Beavers, the Yellow Knives, etc. Their total number is estimated at 32,000. The Athabascans of the North differ greatly in character from the Indians of the South. They lack the fierceness and warlike proclivities of the Algonkins and Dakotas, and are mild, timid, and peaceful in disposition. This, however, is probably a result of climatal and food influences, since the Apache Athabascans of the South are the most ferocious of Indians. Many of the tribes are very debased and grossly improvident, varying from waste and repletion when game is plenty to want and misery when it is scarce. Physically, they are distinguished by square, massive heads, short hands and feet, and beards much stronger than those of Indians generally. The Dog Ribs are meagre, ugly, ill-made, and very low in mental development. The Hare and Slave tribes of the valley of the Mackenzie are among the most wretched of mankind. They are puny and stunted in figure. Their clothing is made of rabbit-skins, they have no tents or huts, and they often practise cannibalism. The Tahkali of British Columbia have peculiar customs. They live on putrid meat, have no known ideas of God or of religion, and burn their dead. The wife is nearly burned alive with the corpse of her husband, being forced on to the funeral pile, and only allowed to escape when severely scorched.

The traditions of the Athabascans speak of an original migration from the west and from a country inhabited by very wicked people. These traditions seem to point to Asia as their place of origin, since they speak of the crossing of a great lake full of islands where it was always winter, with ice and deep snow.

The Athabascans of the South differ greatly in character and in degree of civilization from those of the North. The Apache tribes are wild and savage nomads, destitute of organization or of any trace of progress; but the Lipans are quiet and peaceful, and the Navajoes have made some advances in civilization. They have a native art of agriculture, possess many domestic animals, and are skilled in the weaving of blankets, which are greatly prized by the neighboring tribes.

ATHEISM, as a theory, is the denial of the existence of God—*i. e.*, of the wise, righteous, and loving Personality who created and sustains all finite existence, is the source of all order, the standard of all excellence, and the final end of all his creatures. It is the contradictory of *Theism*. The term has been used loosely by the older writers as equivalent with *infidelity* generally, with deism, with pantheism, and with the denial of immortality. Diagoras of Melos, a disciple of Democritus, was the first who was designated as an atheist, but it would seem not so much for his speculative opinion as for his taking part in a parody of the Eleusinian Mysteries. Indeed, the ancient use of the word was generally a loose one. It was applied to Anaxagoras, because he taught the spirituality of God; to Socrates, because he weaned the young people of Athens from an unreflective idolatry; and to the early Christians, because their places of worship contained no images.

Atheism is to be distinguished (1) from *Deism*, which asserts the existence and perfection of God and his government of the world by general laws, but which denies the special historical disclosure of God to mankind in any events or persons or written record; (2) from *Pantheism*, which asserts the existence of God, but identifies him more or less with the universe, visible and invisible, and either denies or detracts from his ethical personality; (3) from *Positivism*, which denies the possibility of extending human knowledge beyond the sensible phenomena to their real causes, and rejects all hypotheses as to the origin of the universe, while admitting the theistic hypothesis to be the most reasonable of any, and asserting that atheism is the most irrational form of theology; and (4) from *Agnosticism*, which, while admitting the possibility of a perception of causes in the secondary departments of knowledge, and recognizing the presence of a mystery which challenges our awe in this, regards the theistic hypothesis as an anthropomorphic attempt to explain the inexplicable, and refuses to ascribe personality, will, consciousness, or any other quality given in human experience, to the Unknowable.

To *Naturalism* (or the doctrine that attributes everything to natural law) and *Materialism* (or the doctrine that resolves the universe into a single substance which is perceptible to sense) atheism is related by many points of contact. But there are atheists who are not materialists, and there are naturalists, and even materialists (Belsham, Priestley, Geo. Storrs), who are theists. So, again, while atheists generally deny the separate existence and immortality of the soul, there are some who assert both. *Nihilism* differs from atheism in that it refuses to enter upon the question whether there is a God, and rejects his authority and even the supposition of his existence and his omnipotence, as it rejects the authority of kings, and even of parents.

Practical atheism is the refusal to submit ourselves to the authority of God, and the attempt to construct or conduct life as though he did not exist. Every conscious transgression of the law of God, "every sin, really designs deicide" (Dr. John Duncan); and in every man who is a sinner there opens this black and bottomless pit of atheism. In this sense Plato calls atheism "this disease," and with him Paul the apostle agrees in tracing the "reprobate mind," which found its expression in pagan immoralities, to men's unwillingness "to retain God in their knowledge." Practical atheism may coexist with the soundest theistic opinions, and indeed is not far from any man. For lines of moral distinction, as Jesus Christ told the people of his time, are truly traced only when they are perceived to run, not past us, but through us.

History.—The history of atheism, therefore, would be the complete story of the moral aberrations of the human race. The history of atheistic opinion is not so extensive. Atheistic theory is ordinarily confined to conventionalized periods in social development, when men have got away from the primary sources of feeling, and have acquired the courage to construct justifications for any line of action they may have chosen. In India we find the laws of Manu excluding rationalists from certain ceremonies as atheists (*nastikah*). The Nayaya system of philosophy, as developed by Kanada, appears to be atheistic, the name of God occurring not once in his system. In close relation to the Hindu philosophic systems stands Buddhism. What attitude it assumed formally towards the gods of the Hindu pantheon is matter for debate. But it is beyond doubt that it furnished a system of religion of a very severe ascetic type, in which deity plays no part, either as helper of the individual or as lawgiver for the race. The iron wheel of moral necessity binds both gods and men. Salvation is escape into *nirvana;* but whether nirvana means extinction or a state of conscious repose, it is a condition to whose attainment and enjoyment the gods contribute nothing. It is neither absorption into Brahm, nor repose in the paradise Allah keeps for the true believer, nor an intelligent and ethical fellowship with a Father in the heavens. If heaven it be, it is a heaven without a personal centre, as the life which leads to it is a life outside of relation to any power except impersonal moral necessity. Buddhism is a palmary illustration of the truth that atheism is no escape from the necessity for a religion.

In Jewish literature we find from the time of David and Solomon allusions to "the scorner," a type of sceptic who, apparently, is represented more explicitly by "the fool" who "saith in his heart, There is no God" (Ps. xiv. 1 and liii. 1), and with whom the "generation (class or set) of the righteous" is contrasted. In a severely ethical faith like Judaism atheism must have been a moral revolt justifying itself by speculative negations. In later Judaism, and in its congener Islam, atheism presents itself only in furtive and evasive forms. The free-thinkers (*mu'tazilites*) of Islam aimed merely at the construction of a rational theology with the help of the Greek philosophy. But the *Rubaiyat* of the dissolute Omar Khayyam shows, under the use of other terms, a veiled atheism. Of later Jewish witers, Spinoza and Uriel d'Acosta have been stigmatized as atheists, but unfairly.

In Greek literature atheism appears in its natural alliance with materialism. The Ionic school of philosophy (Thales, etc.) fell into a mode of philosophizing which, if not atheistic, was at least naturalistic. The atomic theory of Leucippus and Democritus, followed by Epicurus and Lucretius, is the first attempt to explain the origin of the universe without assuming a creative will and intelligence. Eternal atoms in eternal motion were supposed to furnish an automatic universe, and to account for even the human soul, which finds its highest good in happiness. Atheism reappears in the teaching of the Sophists, that man is the measure and standard of all things, and that there is no other. It found a zealous antagonist in Socrates, and in his greater disciple Plato (*De Legibus*, lib. x.). Yet something like it reappears in the sceptical teachings of the late Academy and in its successors the Pyrrhonists.

From the extinction of the school of Epicurus until the Italian Renaissance, atheism disappears from the history of European thought, although the accusation was brought against some unfriends of the Church, notably the emperor Frederick II. But even in the period of the Renaissance the manifest danger of avowing such opinions led to compromises, such as that by which Pomponacci qualified his purely naturalistic philosophy by a declaration that what philosophy might prove could not invalidate the positions of the true faith. But Vanini for teaching a naturalistic agnosticism was burnt at the stake in 1619, as Giordano Bruno had been for his pantheism—called atheism—nineteen years before. In England, Thomas Hobbes, while teaching publicly that the state has absolute authority, and that a good citizen should adopt that religion which is imposed by the civil magistrate, is said to have avowed atheistic opinions privately. A similar respect for established creeds veils a wholesale scepticism in Pierre Bayle, in Mandeville, in the marquis d'Argens, and in the authors of the famous French *Encyclopédie*, and is shown by the constant implication that theistic as well as Christian faith cannot be defended on grounds of reason.

The eighteenth century proved as fruitful in atheists as the age of the Sophists in Greece, to which it bears close resemblance. Deists like Voltaire and Hume, and pantheists like Diderot, contributed to the dissemination of atheistic opinion by encouraging the spirit of irreverence and doubt, and by discouraging mental seriousness. Hume, who himself has been called an atheist, when dining in Paris expressed the hope that there were no atheists present, and was told that all at the table except himself were such. In the *Lettres de Thrasybule à Leucippe*, attributed to Fréret, in De la Mettrie's *L'Homme-Machine* (1748), in Baron d'Holbach's *Système de la Nature* (published in 1770 under the name of J. B. de Mirabaud, a devout Christian priest), and in his anonymous and more popular work *Le Bon Sens* (1772), we have atheism as the final outcome of the empirical philosophy of Locke. Buffon is claimed as in agreement with them, but never avowed it.

The doctrine presents itself in a political form in the transitory literature of the Revolution period, but found an earnest opponent in Robespierre, and again in Napoleon. The charge of atheism was brought against all the great leaders in German philosophy except Kant, but especially against Fichte and Hegel, and with more reason against Schopenhauer. Rudolph Stier stigmatized even Schleiermacher as an atheist. In Germany atheism obtained some currency after the break-up of the Hegelian school in the fourth decade of the century, Ludwig Feuerbach and others of "the left wing" having leaped from Hegel's idealism to materialistic atheism of the most pronounced sort.

The exclusive devotion to physical science which has occupied so much of the intellect of Europe and America during the second half of the present century has produced a new type of atheism. The assumption that science, after achieving so much, is competent to construct a complete philosophy of the universe, has led to attempts to construct a mechanical theory which shall account for all things by the operation of natural law. Darwin's evidence as to the importance (and his theory of the all-sufficiency) of environment to account for the development of species has contributed to this tendency more than any other single cause. But many of those who follow this popular drift stop short of atheism in agnosticism, or the declaration that we know nothing of a First Cause. In Germany the literature of scientific atheism is represented by Moleschott (*Kreislauf des Lebens*, 1852), Vogt (*Kohlerglaube und Wissenschaft*, 1854), Büchner (*Kraft und Stoff*, 1855), Czolbe, Löwenthal, Haeckel (*Noturliche Schöpfungsgeschichte*, 1868), Strauss and others: but has found notable antagonists in Fr. Fabri (*Briefe gegen den Materialismus*, 1864), Fechner, J. H. Fichte, J. Huber, Liebig, Lotze (*Microcosmus*), Schaller, Schleiden, Trendelenburg, Ulrici (*Gott und die Natur*, 1861; *Gott und der Mensch*, 1866–73), and Rudolph Wagner. In France philosophical atheism finds representatives in E. Havet, Renan, Taine, and Vacherot; scientific, in Bert, Biot, De Candolle, and many others; opponents in Abbé Gratry, E. Caro (*L'Idée de Dieu et ses nouveaux Critiques*, 1864), Paul Janet (*Les Causes finales*, 1876), and Jules Simon (*Dieu, Patrie, Liberté*, 1883). In Italy the theistic tradition of the national philosophy was broken first by Romagnosi, but he has had many successors, especially among recent men of science—Barbera and philosophers of what in Italy is called broadly the Positive school, such as Ferrari, Franchi, Tomassi, Bianco, Panizza, etc.

In England the succession of scientific atheists may be said to begin with the elder and the younger Mill, and has been continued by Harriet Martineau, Atkinson. Clifford, the duke of Somerset, John Morley, Edith Simcox, etc. Closely related are the various agnostic schools, led by Matthew Arnold, by Herbert Spencer, and by Tyndall and Huxley; and, more closely than its friends admit, that of the English Positivists, Harrison, Bridges, and Congreve. A popular propaganda of atheism exists in England in the Secularist party, represented by G. J. Holyoake, Chas. Bradlaugh, and Mrs. Besant, and combated by Thomas Cooper, the ex-Chartist. In America Robert G. Ingersoll is the only prominent avowed atheist, but there are many outspoken agnostics, such as Draper, Fiske, Youmans, chiefly disciples of Herbert Spencer.

Noteworthy among the opponents of atheism and agnosticism are the duke of Argyle, Dr. Lionel Beale, Miss Cobbe, Dr. Elam, R. Flint (*Antitheistic Theories*), Shadworth Hodgson, R. H. Hutton of the *Spectator* (*Theological Essays*), James Martineau, Clerk Maxwell, St. George Mivart, J. J. Murphy (*The Bases of Faith*), J. H. Stirling, and Dr. Ward of the *Dublin Review*. The writings of Mr. Mallock on this subject can be regarded only as feats of intellectual gymnastics. In America there have been Francis Bowen, B. P. Bowne, P. A. Chadbourne, B. F. Cocker, J. P. Cooke, Joseph Cook, J. L. Diman, J. W. Dawson, G. P. Fisher, Tayler Lewis (*Plato Against the Atheists*, 1845), Le Conte, James McCosh, E. Mulford (*The Republic of God*, 1881), Martyn Paine, Noah Porter, and Francis Wharton.

Criticism.—The existing civilizations of the world all rest upon some theological basis, and have been developed under the influence of theological ideas. It is difference in these ideas which constitutes the profoundest differences in the civilizations themselves—which makes Buddhist, Hindu, Moslem and Christian forms of organization and atmospheres of thought so different. "Our earth," says Herder, "owes the seeds of all higher culture to religious tradition." Unless Buddhism was such, there has been no attempt to evolve a social system upon atheistic principles; and Buddhism, while atheistic in some of its forms, has taken theological color from previous systems to an extent which forbids it to be regarded as forming an exception to the rule. It was the remark of Plato, of Cicero, and of Plutarch that no nation was to be found which had no belief in a God or gods. Those tribes who, like the Bushmen of Southern Africa, were described by early travellers as without any idea of a God, have proved, on closer examination, by no means so destitute. But if atheism be true, society should be remoulded into conformity with it. The discussion of its truth or falsehood we leave to the article on THEISM, and proceed to consider what must be its necessary effect upon human life and society if it should obtain general acceptance. And what is said will apply with nearly equal force to agnosticism, which, while it expresses for some their embarrassment in the presence of unsolved problems, seems with most of its adherents to be no more than an atheism evading the responsibilities of frankness.

(1) Atheism would imperil the very existence of human society. The background of the eternal is indispensable to the awakening in men of that reverence for institutions which is fundamental to social order. If the state and its institutions be mere contrivances for keeping the strong from using their strength, and the weak from undergoing the natural penalties of their weakness, the illusions upon which these rest, in the absence of an infinite righteousness, cannot be permanent. Men of no devoutness and little faith have felt this equally with others. "If there be no God," said Voltaire, "then for the sake of society we must make one." "No man," said Proudhon, "ever went deeply into politics without getting into theology." The state in its last analysis rests on the unity of the will of the people. A nation exists because its people "will to be one" in distinction from other peoples. But we cannot account for the existence of this volition to unity in the people except on the supposition that it is evoked and sustained by the will of the God of whom the Jewish prophets and kings spoke as the Author of all national life and unity. It is the often but half-conscious sense of this foundation of the social order which constitutes its best safeguard. Men feel, with Shakespeare:

> "There is a mystery . . . in the soul of state
> Which hath an operation more divine
> Than breath or pen can give expressure to."

Destroy this feeling, substitute the belief that the state is a utilitarian contrivance, and the whole edifice will be shaken at its foundation.

(2) Atheism would be fatal to the ethical culture of mankind. God is the postulate of the conscience. Conscience has authority over man's acts, because it shares in his knowledge of the perfect standard of right, conformity to which it demands of both God (Gen. xviii. 25) and man, under penalty, in man's case, of the forfeiture of that ethical fellowship with God which constitutes man's truest blessedness. It is not accidental that atheism has been so generally a revolt against moral law, a disease of the will as well as an aberration of the intellect. And the fact that there are atheists who lead pure and self-denying lives by no means gives us any security that purity and self-denial would survive the general overthrow of theistic belief. Many of those who are alleged as instances of atheistic excellence passed the most plastic period of their life under the influence of theistic belief (H. Martineau, Clifford, etc.); all of them have lived in a society pervaded by that belief, and, as Mr. Mill's *Autobiography* shows, were no more able to cast it off than to escape the all-embracing atmosphere. Even into windows which face northward the sunlight comes. Besides the general injury of shaking the foundations of moral culture, atheism, as

Mr. Hutton has shown in his remarkable essay on *The Moral Significance of Atheism*, would interfere with all the finer developments of moral culture. Lord Bacon well insists that it would exterminate courage by removing the consciousness of a higher and better nature upon which a man stays himself. It certainly would weaken the moral resolve with which men in situations of doubt take up the course which has the heaviest moral considerations on its side, and leave the consequences to God. The consequences of any course of action in a world which no God governs might well be terrifying.

(3) Atheism would open the door to *superstitions* manifold. "Where the gods are not, the ghosts bear rule," says Novalis. La Mettrie was superstitious beyond other men of his time, and he is by no means an exceptional instance of this. The rejection of theistic faith does not extinguish in man the perceptions which reach to the invisible world. It only leaves that world a blank on which the imagination may paint any terror concerning

> "The life that haunts the emptiness
> And horror of the dark."—*Patmore.*

Theology is a check upon the extravagances of the religious instinct. Theists of every kind set bounds by their belief to the exuberance of the imagination. The atheist and the agnostic can fix no such bounds. When the sense of a need of relations with the unknown is awakened in them, there is no security against the revival of all, and more than all, the superstitions which have terrified and tortured mankind. Indeed, the only final escape from superstitious terror and cruelty is through God's revelation of his character to man.

It is to be remembered also that atheism furnishes no solution of the awful problem suggested by the existence of remorse. Buddhism is a standing proof that the torture of a burdened conscience may coexist with the utter disbelief in any being who can say, "Thy sins be forgiven thee." This most hopeless of all faiths, which sets before men the most cheerless end and bids them seek it without help and by the hardest path, is so because it knows of no helping God—of nothing better indeed than the sympathy of a man of like sorrows with ourselves. If atheism be true, then remorse of conscience attains an awful importance as the poison for which there is no remedy—the kill-joy for which there is no alleviation even, save the sternest asceticism for the extinction of all human desires and capacities for enjoyment. Furthermore, atheism gives us no assurance that life ends with the death of the body, or that the possible life beyond death will not be as full of miseries manifold as the imagination of a Dante, a Pinamonti, or an Edwards has conceived.

(4) Atheism would involve a gradual extinction of scientific interest. Not all knowledge of fact is science, but only that which leads on to the perception of the unity there is in the universe. For science (as Bacon says for philosophy) the end is the intuition of unity. Scientific interest finds its true source in the yearning after the knowledge of "the intelligence at the heart of things." Its triumphs are in showing how the great lines of energy converge toward a single point, like the reins to the hand of the charioteer. It is an opinion entertained by many that it will suffice for us to learn of a great mechanical unity of natural laws which binds the universe into one system. But, in the long run, man will not be content to labor on to the discovery of something which is of lesser worth than himself. The consciousness of that in him which is greater than natural law, will work in him disgust with labors which have this only as their end. He will not toil to lift the veil of the universe to find behind that veil only "the empty death's eye-socket" of Jean Paul's wonderful vision. The hope to "think God's thoughts after him" which animated Kepler and Newton is entertained unconsciously by even a Laplace and a Haeckel in their toil to pass from the manifoldness of experience to the unity of law, and to discern the order which underlies the seeming disorder of the universe. "The knowledge of God is the root of all other knowledge: we are capable of knowing our fellow-creatures and of knowing the world of nature only because we are more directly related to him than to them. . . . Science demands God as its foundation; the effect of denying God will be to rob us ultimately of all belief in the possibility of science" (*Maurice*).

(5) Atheism, if generally accepted, would involve the destruction of civil liberty and the establishment of the despotism of either the one, the few, or the majority. If God be the author of civil society, the state has a delegated, and therefore a limited, authority. If it be self-originated, its authority is unlimited, because supreme. Atheistic and pantheistic sociologists like Hobbes, Spinoza, Bentham, Pollock, and the extreme French Republicans, all have asserted the supremacy of the state, and denied the existence of any limit but its own good pleasure. (See Mulford's *Nation*, 1870; Pollock's *History of the Science of Politics*, 1883; and Lorimer's *Institutes of Law*, 1872). The atheistic state, if such a state be possible, will assert its right to override the judgment of the parent as to the discipline and education of his child. It will assail religious convictions and antagonize the sense of religious vocation, because these involve the assertion of an authority higher than itself. It will deny that right of appeal to the higher law which has been the last refuge of those who suffer from or are oppressed by human law. It will be the Leviathan of Hobbes called into life, like another Frankenstein, to prove itself the nightmare of the race.

(6) Atheism robs history of its significance, and reduces it to a hideous struggle for selfish advantage to the tribe or the state. History is, as Lessing expressed it, the story of the education of the human race by God. It is this that makes its dark places endurable, in the belief that they are but the necessary transition to a higher light, and that a wise Intelligence permitted and limited their existence, and has higher compensations in store. But Schopenhauer's view, that history is as unmeaning as the conflicts of wild beasts in the forest over their prey, would be the natural one if we ceased to see in the story of mankind the onward leading of a loftier Intelligence than ours which "from the beginning discerns the end." At the utmost, a dry antiquarianism and a barren sociology would remain, and the students of neither would dare to ask themselves as to the worth of their studies.

No theist believes in the possibility of such results as these, because he does not find it possible to think of God as leaving the world to itself. The state of pagan society at the beginning of our era, described profoundly by the apostle Paul in his Epistle to the Romans, constitutes probably the nearest approach to real atheism the world ever made or ever will make.

LITERATURE.—Cudworth, *The True Intellectual System of the Universe* (London, 1678, and Andover, 1837); J. Thomasius, *Historia Atheismi* (Altorf, 1713); Leclerc, *Histoire des Systèmes des anciens Athées*, in his *Bibliothèque Choisie* (1703-13); Reimann, *Historia Atheismi et Atheorum falso et merito suspectorum* (Hildesheim, 1725); Sylvain Maréchal, *Dictionnaire des Athées* (Paris, 1799); Adam Farrar, *History of Free Thought* (1863); F. A. Lange, *Geschichte des Materialismus* (Iserlohn, 1867; English translation, London and Boston, 1877); Prof. J. Stuart Blackie, *Natural History of Atheism* (Edinburgh, 1877). (R. E. T.)

ATHENS, the county-seat of Athens co., Ohio, is on the Hocking River, 41 miles W. of Marietta, and on the Marietta and Cincinnati Railroad and the Hocking Valley Railroad. It contains five churches, a national bank, two weekly newspapers, two planing-mills, two flour-mills, a water-wheel factory, a woollen factory, and a foundry. It is also the seat of the Ohio University, founded in 1802, the oldest college northwest of the Ohio River. The national Congress gave

See Vol. III. p. 12 Am. ed. (p. 11 Edin. ed.).

two townships of land for its perpetual support, and the Ohio legislature recently granted $25,000 for the improvement of its buildings. Athens was incorporated Dec. 6, 1800, being the second in the North-western Territory, Marietta, the first, having been incorporated three weeks earlier. Across the river is the Athens insane asylum, one of the largest and best appointed in the world. Population, 2457.

ATLANTIC, the county-seat of Cass co., Iowa, is on the East Nishnabotna River, 60 miles E. of Council Bluffs. It is on the Chicago, Rock Island, and Pacific Railroad, and has other railroads running in different directions. It has one daily and two weekly newspapers, a court-house costing $60,000, an opera-house costing $20,000, a national bank, several churches and schools with fine buildings, a large alcohol distillery, canning-works for corn and tomatoes, flouring-mills, foundries, and other industrial establishments. Population, 3662.

ATLANTIC CITY is a popular seaside resort in Atlantic co., N. J., 64 miles S. E. of Philadelphia. It is at the north-east end of Absecon Beach, a sandy island ten miles long and three-quarters of a mile wide, extending from Great Egg Harbor Inlet to Absecon Inlet. To this place three railroads run from Philadelphia—the Camden and Atlantic, the Philadelphia and Atlantic City (narrow-gauge), and the West Jersey. The first settlement on the island was made in 1783 by Jeremiah Leeds, who cleared a farm there; in 1852 a town was laid out, and in 1854 Atlantic City was incorporated, and the first railroad was built soon afterward. A lighthouse was erected here in 1856. The city has a national bank, a city hall, eight churches, private and public schools, a large number of handsome cottages, and more than 100 hotels and boarding-houses. It is lighted with gas. There are two weekly newspapers, which issue daily editions during the summer season. The total valuation of property is $5,000,000; the public debt is $34,000, and the expenses for 1881 were $45,000. The two great advantages of the place are its excellent beach for bathing and its comparatively dry and equable climate. The sanitary arrangements are good, and water for drinking and culinary purposes is collected in cemented brick cisterns to avoid sewage contamination, while an additional supply is procured from the mainland through a system of pipes. In the summer, besides the guests that remain a week or longer, there are daily thousands of excursionists from Philadelphia; in the winter there are also many visitors on account of its even temperature. The resident population is 6500.

ATLEE, WASHINGTON LEMUEL (1808–1878), an American physician and surgeon, was born at Lancaster, Pa., Feb. 22, 1808. He was a grandson of William Augustus Atlee, who was a judge of the supreme court of Pennsylvania from 1777 to 1793. At the age of sixteen he began the study of medicine with his brother, Dr. John L. Atlee of Lancaster, and subsequently entered Jefferson College, Philadelphia. Having graduated in 1829, he commenced practice at Mount Joy and Lancaster, and became an ardent student of botany and other sciences. He afterwards removed to Philadelphia, and subsequently became professor of medical chemistry at Jefferson College, which post he held until 1853, when he resigned on account of the demands of his private practice. He continued an active member of the American Medical Association and of other societies. He was a brilliant speaker and an able writer, constantly advocating higher medical education. He published in various journals more than eighty important papers on medical and scientific subjects, but is especially distinguished for his numerous successful operations in ovariotomy. He defended the propriety of this surgical operation when it was opposed by nearly all American surgeons, and vindicated the correctness of his opinion by its successful performance in more than three hundred cases. The prize essays of the American Medical Association for 1853 include one written by him. In 1872 he published a volume in which he summed up his extensive experience in ovariotomy, entitled *General and Differential Diagnosis of Ovarian Tumors, with Special Reference to the Operation of Ovariotomy, etc.* (Phila., 1872). He died Sept. 6, 1878.

ATOLL, a name given to ring-shaped coral reefs or islands that occur in the Indian and Pacific oceans, enclosing a central expanse of tranquil water called a lagoon, in which there is no land. These atolls are usually oval or circular in form. The lagoon is often connected with the ocean by an inlet (which is always on the leeward side), and affords a safe harbor for vessels. Its depth is in some cases 200 or 300 feet. The atolls appear to rise out of profound depths, as soundings on the seaward margin in some instances indicate a depth of 1000 fathoms very near the shore. These islands, which are sometimes 40 miles in diameter, are low, seldom rising more than ten feet above the level of the sea. Many of them are inhabited, and produce a luxuriant vegetation, but they are necessarily destitute of hills, valleys, rivers, metals, and other important resources of civilized life. The cocoanut-palm is the most useful and characteristic plant of the atolls. It appears that the site of the atoll was originally a submarine mountain or volcanic cone which gradually subsided (after the structure began) until it disappeared and its place was occupied by the lagoon. The formation of these reefs was explained by Darwin, who ascribed it to the slow subsidence of their foundations. "Each shallow," says Malte-Brun, "is converted into an island; each island is improved into a garden." Some atolls are rings of islets having many inlets.

ATTACHMENT, in law, a process from a court of record under which the person or property of one is taken and held to abide the judgment of the court. As a process against the person, it is used to bring before the court one who has been guilty of contempt of court, which may be by either (1) neglecting or abusing its process or that of another issued under its authority, or (2) disregard of the authority of the court by refusing to obey its decree, or (3) by openly insulting the court. As a process against property, attachment of the property rights, credits, or effects of any kind of the defendant in a suit is made by the sheriff in pursuance of a writ issued by the court for the purpose of securing or satisfying the claim of the plaintiff. The object of the proceeding was originally to compel the appearance of a defendant in a suit by taking possession of his property as a pledge. As a defendant who resided outside the jurisdiction of the court, but had property within it, could not be brought into court by an ordinary summons, a writ of attachment against his property was allowed as a means of bringing him into court; and such a suit was called *foreign attachment*. In this country the proceeding by attachment has been gradually so far extended as to hold the property of the defendant bound until the final judgment in the suit, (1) in all cases where the defendant is a non-resident, (2) in cases where there has been fraud in contracting the debt or in the conduct of the debtor, and, in some States, in all cases where there is a claim arising from a contract, even where the defendant is a resident and where there is no allegation of fraud. In all the States attachment is allowed where the defendant is a non-resident. Where the defendant is a resident and an attachment of his property is permitted on the ground of fraud, the allegations generally must be of fraud either in the contraction of the debt or in the subsequent conduct of the debtor, such as evading the process of the law, absconding, concealing or disposing of his property, or being about to do so, with intent to defraud his creditors. Attachment is allowed in such cases in almost all the States and Territories. In California, Connecticut, Maine, Massachusetts, Montana, Nevada, New Hampshire, Oregon, Rhode Island, and Vermont an attachment may be had for a debt arising from a contract without any allegation of fraud,

See Vol. III. p. 45 Am. ed. (p. 51 Edin. ed.).

and subject only to the proviso, in some States, that the debt is not already secured. The attachment binds all the property rights, credits, and effects of every kind of the debtor in the hands of every person upon whom the writ is served. Such person is called the *garnishee*. He is entitled to interpose any defence which he may have against the defendant in the attachment, his alleged creditor, but when judgment is rendered against him, by paying the amount of it he is discharged to that extent from all liability to the defendant. Attachments are always allowed in execution upon a judgment when the property of, or debts due to, the judgment debtor is found in the hands of other persons. (See EXECUTION.) (S. W.)

See Vol. III. p. 46 Am. ed. (p. 52 Edin. ed.).

ATTAINDER. The doctrine of attainder has received little favor in this country, where it has generally been thought unjust to disinherit men because their kindred became felons, and to take away their property for accidents unavoidable by them.

The Constitution of the United States, Art. iii. § 3, provides that no attainder of treason shall work corruption of blood or forfeiture, except during the life of the person attainted; and the act of Congress of April 30, 1790, c. 9, § 24, abolishes forfeiture of estate and corruption of blood under the laws of the United States, whether for treason or felony. In some of the older and more conservative States, as New Jersey, New York, Pennsylvania, and South Carolina, there are early traces of the common-law doctrine; but now the constitutions of nearly all the States provide that no conviction shall work corruption of blood or forfeiture of estate. In the constitutions of Delaware, Kentucky, and Pennsylvania the clause is added, "except during the life of the offender." Many contain the additional safeguard that the legislature shall pass no bill of attainder; which latter provision alone, or its equivalent, is contained in the constitutions of California, Connecticut, Iowa, Massachusetts, Michigan, Nevada, and Virginia. In Louisiana, Mississippi, New Hampshire, New York, North Carolina, Rhode Island, and Vermont there is no constitutional change of the common law, although many, if not all, have abolished attainder by statute.

Very curiously, the constitution of Mississippi, adopted in 1832, both forbade the passage of a bill of attainder and abolished corruption of blood and forfeiture of estate, while the later constitution, apparently by the intention of its framers, contains nothing upon the subject. The law of Louisiana is not grounded upon the common law of England, but upon the civil code, in which attainder and forfeiture were unknown. It was not necessary, therefore, to provide for their abolition. (J. M. G.)

ATTESTATION (Lat. *ad*, to, and *testari*, to witness), the act of witnessing an instrument in writing at the request of the party making the same, and subscribing to it as a witness.

Deeds, at common law, need not necessarily be attested, and in several States it is not required by statute. In Alabama, Arkansas, Illinois, Indiana, New York, and New Jersey attestation is specially required before the proper official, and any statutory regulations on the subject must always be observed and fully complied with. These regulations differ in almost every State. In Mississippi one witness is enough; in Connecticut, Delaware, Georgia, Illinois, Indiana, Kentucky, Michigan, New Hampshire, Ohio, South Carolina, Tennessee, and Vermont, two are required. The requisites as against the grantor and against the grantee are not always the same. If the attestor sign in the grantor's presence and at his request, it is sufficient; he need not *see* the grantor write his name.

Wills must be attested by competent or credible witnesses, who must subscribe in the presence of the testator and at his request. The following form, with slight modifications, is usually employed: "Signed, sealed, published, and declared by the above-named testator, as and for his last will and testament, in our presence, who, in his presence, in the presence of each other, and at his request, have hereunto subscribed our names as witnesses." As to the number of witnesses in attestation of wills, three are required in Connecticut, Florida, Georgia, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Hampshire, New Jersey, North Carolina, Rhode Island, South Carolina, Vermont, and Wisconsin; and two in Alabama, Arkansas, California, Delaware, Illinois, Indiana, Iowa, Kentucky, Minnesota, Missouri, New York, Ohio, Tennessee, Texas, and Virginia.

ATTICA, a thriving city of Fountain co., Ind., is on the east bank of the Wabash River, 60 miles N. W. of Indianapolis. It is on the Wabash, St. Louis, and Pacific Railroad, and is the terminus of the Chicago and Block Coal Railroad and of the Attica, Covington, and Southern Railroad. It has a national bank, a weekly newspaper, excellent schools, plough-, wagon-, and carriage-factories, and other industrial works. The water used comes from springs owned by the city, and is distributed from a reservoir on a hill adjacent to the springs, the fall in the business part of the city being 150 feet, and the entire works costing but $40,000. Attica was laid out by G. Hollingsworth in 1825, and was incorporated as a town in 1849, and as a city in 1866. Population, 2150.

ATTICA, a village of Wyoming co., N. Y., is on Tonawanda Creek, 31 miles E. of Buffalo. It is on the New York, Lake Erie, and Western Railroad and on the Batavia and Attica branch of the New York Central Railroad, and is the northern terminus of the Tonawanda Valley and Cuba Railroad. It has six churches, a large school, a large flour-mill, railroad machine-shops, several factories, and numerous stores. The village was incorporated in 1836. Population, 1935.

See Vol. III p. 55 Am. ed. (p. 62 Edin. ed.).

ATTORNEY, in law, any one who acts for or in the stead of another. In this, its widest signification, it is equivalent to AGENT (which see), but the word is commonly used to indicate the special class of agents known as lawyers, who conduct legal proceedings for their clients. Originally, by the common law, a suitor was obliged to appear in person, and it was only by a special dispensation that he could appear by his attorney; but by the Statute of Merton and subsequent enactments appearance by attorney was permitted to all the parties in a suit. The duties of attorneys-at-law are regulated by statute in all the States, and the admission to practice is governed to a great extent by the rules of the several courts. Generally, a course of study for a prescribed period, pursued under the direction of a practitioner, and an examination by a board of examiners appointed by the court, are the conditions for admission to the bar. In some cases a student of law who has pursued his studies for the full period and has obtained a diploma from a law-school of recognized standing is admitted to practice without further examination. As the office of attorney-at-law is one of so much responsibility, the interests of the community require that great care should be taken that only fit persons be admitted to practice; and much attention has been given to the subject of late, and an effort made to bring about some degree of uniformity throughout the country in the standards of admission. (See the report of the committee on this subject to the American Bar Association, printed in the proceedings of their meeting held in August, 1881.)

A *letter*, or, as it is more commonly called, a *power* of attorney, is an authority in writing given under hand and seal by one person to another to act for him in any matter therein specified. It is merely a formal method of appointing an agent (see AGENT). The person executing the letter of attorney is called the *constituent*, and the constituted agent is called an *attorney-in-fact*.

See Vol. III. p. 55 Am. ed. (p. 63 Edin. ed.).

ATTORNEY-GENERAL, an officer whose duty it is to give professional aid and advice to a state or the executive thereof in legal matters. This officer exists in the various States of the American Union and in the

Federal Government, deriving his origin from the similar officer in Great Britain. The attorney-general of the United States is the head of the Department of Justice and is a Cabinet officer, deriving his appointment from the President with the concurrence of the Senate. It is his duty to attend generally to the conduct of legal cases in the Supreme Court of the United States and in the Court of Claims in which the United States has an interest, either in person or by one of his deputies; and whenever he deems it advisable he may conduct any case in which the United States has an interest in any part of the United States. He examines the title to all lands bought by the United States for the erection of arsenals, post-offices, etc.; exercises a general supervision over district attorneys and marshals in every part of the United States, and over their accounts; nor shall any money be paid out for the uses of the Department of Justice except upon requisition signed by him. Another highly important part of his duty is to give his opinion as to questions of law asked by the President or any head of a department, and such of these opinions as he deems valuable for preservation are published. The salary of the attorney-general was fixed by the act of 1874 at $8000; in case of his inability to act, his functions are to be performed by the solicitor-general. The prosecution of criminals by information filed by the attorney-general, without the intervention of a grand jury, is one of the functions of the attorney-general in England, but the Fifth Article of the Amendments to the Constitution of the United States provides that "no person shall be held to answer for a capital or otherwise infamous crime, except on a presentment or indictment of a grand jury, except" generally in the army or navy. Hence this method of procedure is not employed under the Federal Government. The attorney-general in the different States has generally similar duties; in many of the States he is elected by the people, as are the other State officers, but in others he is appointed by the governor. In most of the States criminal informations are not common or are even prohibited by constitutional provisions; but in some few States this method of prosecution is still allowed, and in some it is the most frequent method. In such cases the duty of filing them belongs to the attorney-general or to the law officer of the State in the proper county. (WM. M. M.)

ATWATER, LYMAN HOTCHKISS, D. D., LL.D. (1813–1883), an American Presbyterian minister and educator, was born at New Haven, Conn, Feb. 17, 1813. He graduated at Yale College in 1831, and a year later entered Yale Divinity School. While still pursuing his studies there he became tutor of mathematics in Yale College. In May, 1834, he was licensed to preach. He was installed pastor of the First Congregational Church of Fairfield, Conn., July 29, 1835. In September, 1854, he resigned his pastorate to accept the newly-established professorship of mental and moral philosophy in Princeton College. After the outbreak of the Civil War in 1861 the college became financially crippled, but through Dr. Atwater's efforts an endowment fund was raised exceeding all its previous productive funds. After acting for some time as president of the college he became professor of logic and moral and political science. In 1861 he was made lecturer extraordinary in the Princeton Theological Seminary on the connection between metaphysical science and revealed religion for the five years during which the lectureship was established. He died at Princeton, Feb. 17, 1883. He contributed to the *Literary and Theological Review*, the *New Englander*, the *Biblical Repository*, the *Bibliotheca Sacra*, and to the *Catholic Presbyterian*, but chiefly to the *Princeton Review*, of which he was editor, principal or associate, from 1869 to 1878. His contributions to this *Review* amount to several volumes on a great variety of subjects, philosophical, theological, ethical, economic, and miscellaneous. He also published a *Manual of Logic* and some sermons.

AUBANEL, JOSEPH MARIE JEAN BAPTISTE THÉODORE, a French writer, son of a publisher of Avignon, was born in that city March 26, 1829. Adopting his father's business in his native city, he has been one of the chief movers in the revival of the Provençal language and poetry. He has edited and published the principal collection of these antique poems, and has actively aided Mistral, Roumanille, Saboly, and Peyrol in the labor of preserving valuable relics of ancient French literature. His chief original poem. *The Pomegranate Opened* (Avignon and Paris, 1860), is also written in the Provençal language, and its success has obtained for him the title of "the French Petrarch."

AUBURN, the county-seat of De Kalb co., Ind., is on Cedar Creek, 23 miles N. of Fort Wayne. It is on the Baltimore and Ohio Railroad, the Fort Wayne and Jackson Railroad, and the Detroit branch of the Wabash, St. Louis, and Pacific Railroad. These roads cross at Auburn Junction. The town is well supplied with hotels, churches, and schools, and has a court-house, a jail, and two weekly newspapers. Its industrial establishments comprise two flouring-mills, planing-mills, a hub- and spoke-factory, stave- and heading-factories, a large foundry, and a woollen mill, besides smaller works. Auburn was laid out by Wesley Park in 1836, and has been the county-seat ever since. Population, 1542.

AUBURN, a city, and county-seat of Androscoggin co., Maine, is on the west bank of the Androscoggin River, connected with Lewiston, on the opposite side, by four bridges, two of which are railroad bridges. It is 34 miles N. of Portland, on the line of the Maine Central Railroad and on a branch of the Grand Trunk Railroad. It has a court-house, two national banks, two savings banks, four hotels, seven churches, a high school and good graded school system, a cotton-mill, a foundry, a furniture-factory, several boot and shoe manufactories, employing a capital of $1,000,000, and other industrial works. Originally a part of the town of Minot, it was incorporated as a town in 1842 and as a city in 1869. It forms one community with Lewiston. Its property is valued at $5,100,000. Population, 9555.

AUCTION. In modern trade an auction has become a well-known mode of selling many kinds of merchandise. Coffee is thus sold three times a year at Padang, the chief port in the island of Sumatra. At Sydney in Australia and Auckland in New Zealand, and in London, wool has been sold by auction for many years. In London this is also the regular mode of selling hides, skins, leather, horns, bones, and hoofs, tallow, and all kinds of lumber and timber, besides fruit and other products. During the business depression in the United States from 1873 to 1879 many woollen and cotton goods, carpets, boots and shoes, mattings, oil-cloths, etc., fell under the auctioneer's hammer. In many countries real estate has long been sold by auction, especially in cases of insolvency, death of the owner, or refusal by him to pay taxes, and in other legal proceedings. The quantity of real estate thus sold in the United States every year, by order of the courts, is enormous.

See Vol. III. p. 60 Am. ed. (p. 68 Edin. ed.).

This mode of selling things has its advantages: it is cheaper and quicker, and the prices realized are often quite as satisfactory to sellers as the prices obtained by private dealers. Some persons deny this; they maintain that auctions reveal the weakness of the market and tend to destroy prices. When auctions are the usual modes of selling goods, as satisfactory prices are received as would be at private sale, but when they occur irregularly the prices obtained are perhaps lower than they would be if sales were effected in the ordinary manner. In some cases auction-buyers pay very high prices in order to keep the goods offered for sale out of the possession of rivals. Were buyers to combine, as did the farmers of taxes in Greece during the time of Alcibiades, and offer only certain prices, such an arrangement would impair the utility of auctions. But combinations of this kind are not often formed. Even the Athenian tax-farmers did not always succeed in preventing competition. Plutarch mentions an instance in which an alien, under the protection of the state, was urged to bid against the farmers of taxes by Alcibiades. Having outbid them, the chagrin of the tax-gatherers was complete when Alcibiades became the alien's surety. Though bidding a talent more than any one else, his competitors offered him an additional talent for his contract, which was accepted.

Auctions are conducted in several ways. Twice a year trade-sales of books take place in New York, which usually last several days. Most of the publishers send copies of their publications for disposal in this manner. At these sales the buyer has the right, if he chooses to do so, to take all the books sent for sale of the kind struck off to him at the price offered, or a portion of the entire number, or only the particular lot set up for sale in the first instance. At the other book-auctions each book or series of books is sold by itself. Perhaps the sale of household goods by order of the executor or administrator is more universally known than the auction-sale of anything else. "Dutch auctions" consist in setting up things at a certain price by the auctioneer, and then lowering it until a bidder is willing to give the price named. The fishermen on the north coast of England resort to these auctions to sell their fish.

There have been periods in the history of the United States when auctions were conducted on a large scale, and when they seriously affected general trade and manufactures. One of these periods was very recent, since the panic of 1873. After that event prices began to shrink, buyers were disinclined to purchase any more than was absolutely necessary while the market was falling, and almost all kinds of goods accumulated. But in many cases money had been borrowed to manufacture them, notes must be paid, and there was no other mode of selling goods than by auction. In these cases auctions were forced sales, and the quantities sometimes sold in a single day were enormous. Those who thus sold at the beginning of a season were more fortunate than subsequent sellers, and the complaint was general that with respect to several kinds of goods the market was demoralized by these operations.

Previous to the War of 1812 there were but two or three auction-houses in New York, and their business was very small. It was then considered a discreditable mode of selling goods, and various devices were practised to conceal the owner's name, such as sending them after dark and using the name of a clerk. Sales on account of underwriters, unsalable goods remaining in the hands of importers at the end of a season, and occasional consignments from English manufacturers were the chief sources of supply for the auction-houses.

During the War of 1812 goods could not be imported directly from Europe; they therefore came through neutral channels or from Canada. Sometimes several houses had a joint interest in an importation. Package sales by auction were considered the most expeditious mode of selling them, and, when goods were scarce, the most profitable also. "The owners," says a writer who was familiar with the facts, "were frequently astonished at the prices obtained at these sales, and there is no doubt that consumers paid, at the period alluded to, thousands of dollars more for goods than they would have done if auction-sales had been prohibited." The prizes taken during the war were always sold at auction. When peace was declared in Feb., 1815, large quantities of goods were imported, and, the city and country stores having scarcely any stocks, competition among purchasers became great and goods were sold at high prices. In eight months of the year 1815 the auction-sales in Philadelphia of foreign goods amounted to $8,000,000.

At this time the auctioneer usually cashed the sales, thus enabling the importer to remit the proceeds immediately to Europe for more goods. "The facility that auctioneers furnished for forcing goods into the market beyond our actual wants contributed in a great degree to that widespread ruin which desolated our country in 1816." Merchants, finding that they could sell goods with such great facility at auction, ordered twice as many as they would have done had their sales been made in the ordinary manner. When these immense orders reached England they had the effect of raising the prices there. The unusual demand ceased late in the autumn of 1816, after the merchants generally had purchased their stocks. Though prices began to decline during the winter, yet the auction-rooms were daily crowded, until the price of many articles fell so low that the sum received did not much exceed the duties. Almost every importer and jobber was prostrated by this sudden turn in the tide.

As no orders were sent to Europe for several months after the overstocking of the American market, goods accumulated there, and the foreign manufacturer was obliged to find a market for them. Agents were sent to this country. They determined to try once more to sell goods by auction. The auctioneers became their bondsmen for the duties, the law requiring that the sureties should be American citizens. The auctioneers also made immediate advances on the importations, and thus they rapidly increased. "Auctioneers at that time increased in number, wealth, and influence; they were directors in nearly every bank in the city, and could thus obtain discounts to an indefinite amount and control the market." The first flight of English agents was taken from necessity, to enable the manufacturers to sell their surplus products, but this mode of selling their goods was afterwards continued because it was profitable. In 1817 and 1818 the depression had somewhat subsided, and some articles became scarce; the agents had now grown expert; they constantly advised the foreign manufacturer of every change; and thus the business of supplying the American market through his own agents became established.

The American importer continued to import goods, but he could no longer do so profitably. "How could it be otherwise," says a trustworthy writer, "when orders have been frequently given to English manufacturers, and the same ship that brought the goods has also brought from the same houses other similar parcels on their own account, which were sent to the auction-room almost before the importer had received his goods from the vessel? The manufacturer had taken advantage of the information furnished by his American correspondent, and after filling his order had also supplied his customers. This is a fact of which many instances might be quoted."

The auction system, as it was called, played a very important part in the history of American manufactures for more than thirty years after the close of the Second War with Great Britain. It was one of the agencies employed to depress and ruin American industries, and too often was effective in accomplishing this result. Another effect was to drive many Americans out of the business of importing. The business thus lost to them has never been regained, nor is there any prospect that it ever will be. (A. S. B.)

AUDIFFRET, Charles Louis Gaston, Marquis d' (1787–1878), was born in Paris, Oct. 10, 1787. He was descended from the ancient Italian family of the Audiffredi, who established themselves in Provence in the twelfth century. In 1805, after having completed his studies, he entered the administration of the finances, and was in 1812 named chief of the bureau and auditor to the Council of State. In 1814 he eagerly welcomed the return of the Bourbons, and was made chief of division and chevalier of the Legion of Honor. He was appointed director of petitions in 1817 and councillor of state in 1828, and was made president of the court of accounts in 1829. Under Louis Philippe he held his seat at the Luxembourg, as a peer, from 1837 to 1848, and under the Empire was made a senator Jan. 24, 1852, and in 1855 he was admitted to the Academy. After holding the presidency of the court of accounts thirty years. he resigned in May, 1859, to become president of the administrative council of the Society of Commercial and Industrial Credit. In 1847 he had been made grand officer of the Legion of Honor, and he received the grand cross in Dec., 1869. He died in Paris, April 28, 1878. Most of the improvements introduced into the system of keeping the public accounts after 1814 were due to M. d'Audiffret, and in 1830 he showed, in a report, the results of these measures. In 1838 he presided over the compilation of regulations for the public accounts. His works are chiefly reports, instructions, and discussions of finance. The most important are—*Examen des Revenus publics* (1839); *Système financier de la France* (2 vols., 1840; new ed. 1863–70), an excellent statement of the French finances; *Progrès du Crédit public* (1861 and 1875).

AUDIFFRET-PASQUIER, Edme Armand Gaston, Duc d', a prominent French statesman, was born at Paris, Oct. 20, 1823. He was the son of Count d'Audiffret, but was adopted by his grand-uncle, Baron Pasquier, and made heir to the title of duke, which was conferred on Baron Pasquier in 1844. He was auditor of the Council of State from 1845 to 1848. During the continuance of the Empire his liberal opinions prevented his obtaining any political office except those of councillor-general of the department of the Orne and mayor of the commune, where he owned the fine château of Sacy. In 1871, after the fall of the Empire, he was elected to the Assembly, in which he played an important part. He at once placed himself in the front rank of the moderate conservatives, and displayed vigorous powers of oratory on several occasions, particularly in his speech of May 22, 1872, in which he declared "his hatred of the Empire, the author of the demoralization of his country." A month later he was one of the delegates chosen to impose on M. Thiers a policy in conformity with the views of the majority. He became gradually one of the leaders of the Right Centre, and continued earnestly to oppose the Thiers Government. After the fall of the latter he aided in the negotiations to produce a fusion of the two branches of the house of Bourbon, and was elected vice-president of the National Assembly in 1874, and president in 1875. During his presidency the republican constitution of France was debated and adopted by the Assembly. Though he had heretofore bent all his energies to the establishment of a constitutional monarchy, he now accepted the Republic. In Dec., 1875, he was elected permanent senator, and in March, 1876, was chosen president of the Senate by an almost unanimous vote. This position he held till 1879, when in the new Chamber he was supported by the monarchists, but defeated by the republicans. In Dec., 1878, he was elected a member of the French Academy, though he had never published any work.

See Vol. III. p. 61 Am. ed. (p. 69 Edin. ed.).

AUDITOR (Lat., a hearer, from *audire*, to hear), the name given to an official appointed by competent authority for the purpose of examining, on behalf of the Government, courts of law, corporations, associations, or individuals, the accounts of persons to whom have been lawfully entrusted the receiving and disbursement of money or other property. The United States Government may appoint such officials by virtue of acts of Congress passed April 3, 1817, and Feb. 24, 1819. *In general practice* an auditor is an officer of the court assigned to state items of debit and credit between parties in suits when accounts are in question, and exhibit balance. Auditors may be appointed by courts either of law or equity (in which latter case they are called masters or examiners), at common law in actions of account, and in many States, by special statute, in other actions. They have authority to take testimony, to examine books and other vouchers, and in some States to examine witnesses under oath. Their report must embrace a special account, giving items allowed and disallowed, and the exceptions, if any, taken by either party to their decisions.

An auditor's report is final as to facts in some jurisdictions, unless vitiated by fraud or gross error, but is subject to examination as to any points of law contained in it. Elsewhere it is *primâ-facie* jury evidence, and rebuttal testimony may be introduced to prove incorrectness; in still other States it has no effect until sanctioned by court. If an auditor's report is set aside by court either wholly or in part, it may be referred back to auditors or rectified by the court. If the party in whose favor the disallowed decision was made consents to remit the item in dispute, the report may be accepted without further delay. (E. S. S.)

AUERBACH, Berthold (1812–1882), a celebrated German novelist, born Feb. 28, 1812, at Nordstetten, a village in the Black Forest district of Würtemberg. He was of Jewish parentage, and at the age of twelve left Nordstetten and repaired to Hechingen, where he attended the Talmudical institute. At Carlsruhe he took up classical, without neglecting his Jewish, studies. After completing his course at the gymnasium of Stuttgart, he entered the University of Tübingen, intending to study jurisprudence. He soon, however, abandoned the law, which was little to his taste, for philosophy, in which he became a pupil of Schelling while at Munich, and later of Daub at Heidelberg. He was a zealous member of the Burschenschaft, and in consequence of the active part he took in the student troubles he was (in 1836) arrested and imprisoned for several months in the fortress of Hohenasperg. During that year he published his first essay in authorship, *Das Judenthum und die neueste Literatur*. This was followed by *Das Ghetto*, a series of romances founded on Jewish history. Especially noteworthy were his *Spinoza* (Mannheim, 1837; English translation by E. Nicholson, New York, 1882); his *Dichter und Kaufmann* (Mannheim, 1839; English translation, *Poet and Merchant*, by Charles T. Brooks, New York, 1877). Then followed a translation of Spinoza's works, prefaced by a critical biography of the Jewish philosopher (5 vols., Stuttgart, 1841). Two of his sketches, *Was ist Glück?* and *Liebe Menschen*, novels in the form of Platonic dialogues, appeared originally in magazines, and were subsequently included in the collection *Deutsche Abende* (Mannheim, 1850). In 1842, at Carlsruhe, appeared *Der gebildete Buerger, Buch für den denkenden Mittelstand*, an attempt to present the results of philosophical inquiry in a popular form.

In the mean while he contributed to various periodicals a series of tales illustrating peasant-life, and in these he achieved his first popular literary success. When collected and published, under the title *Schwarzwälder Dorfgeschichten* (Mannheim, 1843; new series, 1853–54; English translation, *Black Forest Village Stories*, by Charles Goepp, New York, about 1858), they were eagerly read and enthusiastically praised in all quarters, and they are to this day as much admired as when they were first published. Their charm lay in their genial humor and in a happy mingling of the real and the ideal. While pure in sentiment and healthy in tone, they deal in the matter-of-fact without becoming commonplace. They have appeared in many editions, and have been translated into nearly every European language. One of these stories, *Die Frau Professorin*, published originally in an annual (*Urania*, issue of 1847), was dramatized, under the title *Dorf und Stadt*, by Madame Charlotte Birch-Pfeiffer, against the wish of the author. The second series of the *Dorfgeschichten* was not so well received as the first. During the years 1845–48 he issued a popular almanac under the title of *Der Gevattersmann*, some of the tales in which were afterward published as *Schatzkästlein des Gevattermannes* (Stuttgart, 1875, 6th ed.).

In 1846 he published *Schrift und Volk, Grundzüge der volksthümlichen Literatur* (Leipzig), in which, in addition to a disquisition on J. P. Hebel, he gave an account of his own literary methods.

In 1846 he married at Breslau, and for some time after that resided at Heidelberg. During the revolution of 1848 he returned to Breslau. His wife, who had long been an invalid, died at about that time. Owing to this affliction, he led a retired life in the midst of political excitement. When, however, the Panslavists claimed the banks of the Oder as Polish soil. Auerbach successfully opposed the claim in various public addresses. His *Tagebuch aus Wien, von Latour bis auf Windischgrätz* (Breslau, 1849). contains his recollections of that period. His tragedy *Andrea Hofer* (Leipzig, 1850) met with but moderate success; a later work for the stage, *Der Wahrspruch* (Leipzig, 1856), fared no better. Among his more important works may be mentioned—*Neues Leben* (3 vols., Mannheim, 1851); *Barfüssele* (Stuttgart, 1856; English translation, *The Little Barefoot*, by Eliza Buckminster Lee); this story has been translated into nearly all European languages, has been illustrated by Vautier (1874), and has also been dramatized; *Joseph im Schnee* (Stuttgart, 1860; English translation, *Joseph in the Snow*, by Lady Wallace, London, 1861); *Edelweiss* (Stuttgart, 1861; English translation by Ellen Frothingham, New York, 1870); *Auf der Höhe* (Stuttgart, 1871; English translation by Fanny Elizabeth Bunnett, Leipzig, 1867; also by Simon Adler Stern, New York, 1875). In this, his most important romance, court-life with its ambitions and intrigues, and peasant-life with its homely, hearty ways, are presented in effective contrast: *Auf der Höhe* is also made the vehicle of an exposition of the philosophy of Spinoza; *Goethe und die Erzählungskunst* (Stuttgart, 1861). From a popular almanac conducted by him during the years 1858–69 he collected a number of sketches, and published them under the title *Zur guten Stunde, gesammelte Volkserzählungen* (Stuttgart, 1872; English translation, *The Good Hour*, by H. Dulcken, London, 1875). A collected edition of his works was published in Stuttgart in 20 vols. (1857–59); a later issue in 22 vols. (1863–64). After that date he wrote *Das Landhaus am Rhein* (Stuttgart, 1869; English translation, *The Villa on the Rhine*, by James Davis, New York, 1869); *Waldfried* (Stuttgart, 1874; English translation by Simon Adler Stern, New York, 1874); *Die Einzige Tochter* (Stuttgart, 1875); *Tausend Gedanken des Kollaborators* (Berlin, 1875); *Nach Dreissig Jahren: neue Dorfgeschichten* (Stuttgart, 1876; English translation by Charles T. Brooks, *Aloys, Lorley and Reinhard, The Convicts*, New York, 1877); *Landolin von Reutershofen* (Berlin, 1878; English translation, *Landolin*, by Annie B. Irish, 1878); *Unterwegs: kleine Geschichten und Lustspiele* (Berlin, 1879); *Der Förstmeister* (Berlin, 1879; English translation, *The Foresters*, New York, 1881); *Brigitta* (Stuttgart, 1880; English translation by Clara Bell, Leipzig, 1880).

Auerbach resided at various times at Frankfort-on-the-Main, Mayence, Weimar, Leipzig, Vienna, Dresden, Berlin, and Stuttgart, but after 1859 chiefly at Berlin. His last days were embittered by the intolerance displayed towards his people by the promoters of the *Judenhetze* in Germany. He died Feb. 8, 1882, at Cannes, in the southern part of France, whither he had gone in the hope of restoring his health. He was buried at Nordstetten, his native village, on the 15th of the same month. (S. A. S.)

AUGIER, Guillaume-Victor-Émile, a French dramatic poet, was born at Valence in the department of the Drôme, Sept. 17, 1820. He is a grandson of Pigault Lebrun, who was a sceptical writer of light novels in the early years of the century, and who traced his descent from Eustache de Saint Pierre, the burgher of Calais. He was intended for the bar, but after excellent studies at the university he gave up law for the drama. His first play, a delicate and delightful picture of old Greek life, called the *Ciguë*, was acted at the Odéon in 1844, and has since been taken into the repertory of the Comédie Française. He was hailed as a member of the school of common sense, as a sort of reaction against the Romanticists was called, although his only connection with it was a friendship for its accredited leader, François Ponsard. In 1845 he brought out *Un Homme de Bien*, and in 1848 *L'Aventurière*, one of his finest and firmest comedies, afterwards revised by the author and known to our stage as the play from which Robertson borrowed the plot of his *Home*. In 1849 he produced *Gabrielle*, in which he considered anew the complication of husband, wife, and lover which has furnished many plays to the French stage, and he held up the husband as the poetic hero. *Gabrielle*, though scoffed at by the light wits of Paris, was a good deed, though it was not its author's best work. It won for its author the Monthyon prize of virtue from the French Academy. It was hailed by acute critics as a sharp protest against the conventional and rather sordid comedy of Scribe and his school. In 1852 he brought out at the Théâtre Français *Diane*, a drama in five acts written for Rachel and modelled on the heroic plays of Victor Hugo; and in 1854 he produced *Philiberte*, a charming comedy of eighteenth-century life. All these plays had been written in verse, in the rhymed alexandrines which the French dramatic poet is expected to use. But in 1852, M. Alexandre Dumas *fils* put on the stage a dramatization of his *Dame aux Camélias*, and thereafter a discussion of social problems was the work of the dramatist. In 1855, M. Augier brought out the *Mariage d' Olympe*, which was plainly enough intended as an antidote to the false sentimentality in favor of the courtesan called forth by the *Dame aux Camélias*. In the same year he collaborated with M. Jules Sandeau in writing the *Gendre de M. Poirier*, perhaps the best French comedy of this century: it revolves on one of the eternal questions, the relations of rank with money, and the story is as simple and straightforward as the workmanship is brilliant. In 1858 was acted his *Lionnes Pauvres*, in which an ugly social scar was laid bare for the first time. Then in rapid succession came a series of four social studies which make M. Augier the foremost of French dramatists; these were the *Effrontés* (1861), the *Fils de Giboyer* (1862), the *Contagion* (1866), *Lions et Renards* (1869); and all four should be carefully considered by every one who wishes to know how firm, how fine, how strong, and how true satiric comedy can now-a-days be written. M. Augier interrupted this series by bringing out in 1864 *Maitre Guerin*, a comedy of less force, and in 1868 *Paul Forestier*, a return to his earlier metrical manner, but with far more passionate fire than in the earlier plays. The first play he produced after the Franco-Prussian war was *Jean de Thommeray* (acted in 1873); this is a dramatization of a tale by M. Sandeau. and it is a picturesque and vigorous appeal to the patriotism of the Parisians. M. Augier's two latest plays are *Madame Caverlet* (1876) and the *Fourchambault* (1878), both of which are domestic dramas of much interest, though not at all equal in strength to his satiric comedies. Besides these plays M. Augier has written others of less consequence, among them one, *L'habit Vert*, in collaboration with Alfred de Musset, and another. the *Prix Martin*, in collaboration with M. Eugène Labiche. He also wrote the libretto of the opera *Sapho*, composed by M. Charles Gounod.

M. Augier was elected a member of the French Academy Jan. 28, 1858, in place of Salvandy. He has gathered his plays into a collected edition, *Théâtre Complet*, uniform with which is a volume of poems. M. Augier's dramatic work is uniformly clean and wholesome. He has distinct and definite ideas of morality, and he acts up to them. His plays are healthy —far healthier indeed than those of any other contemporary French dramatist—and they are also of a firmer literary quality. They are in better proportion; they have more of that precious and indefinable quality called "style;" they are simpler and stronger and more sincere. M. Augier's plays have not the hectic passion of some of M. Dumas's, nor the vigorous, not to say brutal, wit; but they are the result of a keener and more polished mind and of a richer art, and they are better worthy of study. (J. B. M.)

AUK, also spelled AWK, ALK, ALCK, ALKA, and See Vol.III. p. 74 Am. ed. (p. 85 Edin. ed.). Latinized in ornithology as ALCA, a name applied indiscriminately to the short-winged, three-toed sea-birds of the family *Alcidæ* (see ALCIDÆ), but especially appropriate to the great auk, *Alca impennis*, the principal bird of that group, being the vernacular name of that species.

The great auk, *Alca impennis*, is notable in several particulars: It was the only northern bird deprived of the power of flight, in this respect resembling the penguins of the southern seas (*Spheniscidæ*), not through any peculiarity in the structure of the wings and their feathers, but simply from the diminutive size of those members relatively to the weight of the body. This deprivation of the usual means of escape from its enemies doubtless led to its recent extinction, mainly through human agency. It was at one time so plentiful as to furnish a considerable means of subsistence to fishermen and sailors, the birds, unable to fly, being driven like tame geese into pens and slaughtered for the sake of the flesh. It is one of the commonest errors, perpetuated in numberless treatises, to suppose that the great auk was a bird of very high latitudes, dwelling in icy desolation within the Arctic Circle; for it has not been positively ascertained to have ever occurred within that circle. It formerly inhabited the Atlantic coast of North America from Massachusetts northward, as attested by its bones in kitchenmiddens; also South Greenland, Iceland, the north-west coast and islands of Europe. In Iceland its living history has been brought down to 1844, when two were taken on a rocky islet, one of the fowl-skerries off the south-west coast of that island (*Ibis*, 1861, p. 374). On the North American coast it was last alive at the Funks, off the south coast of Newfoundland, where might not long since be seen the stone pens into which the birds were driven. In Nov., 1870, a mummy was found in the vicinity of St. Augustine, Labrador; this fetched $200, and was sent to Europe, furnishing a part of the material upon which the osteology of the species was described by Prof. Owen (*Trans. Zool. Soc.*, v. 317). Some seventy skins, about as many eggs, with bones representing perhaps a hundred individuals, are preserved. Four skins are in American museums—the Smithsonian Institution, the Philadelphia Academy, the Cambridge Museum, and Vassar College, that in the latter collection the original of Audubon's plate. There is an egg in each of the two first mentioned.

Great Auk.

This was the largest species of the family, standing about two and a half feet high; the wing only six inches from the carpal joint to the tip; the tail three inches; the beak high, compressed, sulcate, hooked, three inches or more along the curve of the upper mandible, four or more along the gape. The nostrils narrow and densely feathered. The head, neck, and upper parts blackish; a great spot before each eye, the tips of the secondaries and most of the under parts, white; the bill black, with white grooves.

The razor-billed auk (*Utamania torda*) greatly resembles the above, but is only about half as large, with functionally developed wings, and a narrow white line, instead of a large spot, before the eye. It abounds on the rocky coasts and islands of North America and Europe, congregating to breed in profusion on the ledges of the cliffs with murres, guillemots, puffins, and other sea-birds of its own family, as well as gannets, cormorants, and gulls. It feeds entirely upon fish and other animal substances procured from the water, and its flesh is edible. The egg is single, and, like that of all *Alcidæ*, is large in proportion to the body of the parent, measuring about three inches in length by nearly two in greatest width; the color is white or whitish, heavily spotted and blotched with different shades of brown and neutral tint; laid on the bare rock in June and July. The razor-bill derives its name from the power of the sharp-cutting edges of the beak. It is found in Polar seas as well as the North Atlantic, and casually in the North Pacific. (E. C.)

AULA REGIA, sometimes known as the AULA REGIS or CURIA REGIS, the supreme court of ordinary judicature established by William the Conqueror in England, so called because it was held in the hall of the king's palace. The Aula Regia was presided over by the king himself, or in his absence by the grand justiciar. The other members of the court were the great officers of the palace, such as the chancellor, treasurer, chamberlain, steward, marshal, constable, and the barons of the realm. With these were associated certain other persons, termed justiciars, to the number of five or six, on whom, with the grand justiciar, the burden of judicature principally fell.

All kinds of pleas, both civil and criminal, were heard before the Aula Regia, and in addition other legal business, such as feoffments, releases, concords, and the like, was often transacted before it for the sake of the greater solemnity. The affairs of the king's revenue are also generally supposed to have been attended to by this tribunal, although in the opinion of some they were more properly cognizable by a subaltern court known as the Exchequer.

The course of application to the Aula Regia was of this nature: The party desiring relief paid, or undertook to pay, to the king a certain fine therefor, whereupon a writ or precept issued, bearing teste of the grand justiciar and sealed by the chancellor with the great seal of the realm, directing the sheriff of the county where the injury was supposed to have been done to command the wrong-doer either to do redress or else to appear and answer the accusation lodged against him. This writ the sheriff, after execution, duly returned to the court, and upon it all the subsequent proceedings were founded.

Notwithstanding the establishment of the Aula Regia, the ancient Saxon county courts were still retained, and few of the causes cognizable before them were at first brought into the Curia Regis. While men could have justice administered so near their homes there was no temptation to undergo the extraordinary trouble and expense of commencing actions before this high tribunal. In process of time, however, the power and influence of the nobility in every county so far tainted the administration of justice that any one unfortunate enough to incur their resentment had, in case of injury, little or no hope of redress at the hands of the local courts. In such cases suitors were driven to have recourse to the king's court, where they were generally enabled to obtain impartial justice; and in this way a great quantity of business was brought before that tribunal.

The Aula Regia being distinctively the king's court, and in contemplation of law always presided over by him, was of course bound to follow the king's person in all his progresses and expeditions, and was accordingly held wherever the king might happen for the time being to reside. This ambulatory character of the court was naturally a most burdensome and irksome feature to persons who were obliged to take part in the trial of common causes before it. The barons accordingly procured from King John an express provision in Magna Charta that "*communia placita non sequantur curiam regis, sed teneantur in aliquo loco certo*" (common pleas shall not follow the king's court, but shall be held in some certain place). The certain place established was the great hall of the king's palace at Westminster, where the court of common pleas has ever since remained. The court being thus rendered fixed and stationary, the judges soon became so too. A chief and three other judges were appointed, who were not members of the Aula Regia, and who were empowered to try and determine all cases between subject and subject formerly cognizable by that body.

The Aula Regia, being thus stripped of so considerable a branch of its jurisdiction, soon fell to pieces. In the reign of King Edward I. the functions were subdivided and distributed among distinct courts of judicature. A court of chivalry to regulate the king's domestic servants and an august tribunal for the trial of delinquent peers were erected. A court of exchequer was constituted to manage the king's revenue. The jurisdiction of the already existing court of common pleas was somewhat more clearly defined, and the remaining judicial duties were vested in a court of King's Bench, over which the chief justiciar presided. The barons, however, reserved to themselves the right in Parliament of reviewing the decisions of the various courts, thus perpetuating to the present day in the House of Lords certain features of the Aula Regia.

(L. L., JR.)

AUMALE, HENRI-EUGÈNE-PHILIPPE-LOUIS D'ORLÉANS, DUC D', fourth son of King Louis Philippe and his wife Marie Amélie, was born in Paris Jan. 16, 1822. He was educated in the Collège Henri IV., and at the age of seventeen entered the army. He served several campaigns in Algeria, and was rapidly promoted, becoming captain in 1839 and colonel in 1842. In the Algerian campaign of 1843, at the head of the subdivision of Médéah, he achieved a brilliant success in defeating Abd-el-Kader and capturing his camp and all his correspondence, together with 3600 prisoners and an immense treasure. For this service he was made lieutenant-general and appointed to the command of the province of Constantine. In 1844 he directed the expedition against Biskari. In the same year he was married to Marie Caroline Auguste de Bourbon, daughter of Prince Leopold of Salerno. He became commander-in-chief of the camp of Gironde in 1845, and in Sept., 1847, succeeded Marshal Bugeaud as governor-general of Algeria, about three months after which he received the surrender of Abd-el-Kader. On receiving news of the revolution of Feb., 1848, and of the abdication of the French throne by his father, he resigned his command to Gen. Cavaignac, and joined the royal refugees in England, in which country he resided for many years. He there devoted himself to literary pursuits. Great sensation was excited in 1861 by a pamphlet which he addressed to Prince Napoleon Bonaparte. The French authorities condemned the printer and publisher to fine and imprisonment, and the duke challenged Prince Napoleon, but the latter refused to meet him. The imperial Government also interfered with the publication of other works by the duke. He was chosen a member of the National Assembly in Feb., 1871, soon after which date the decree which excluded the Orleans princes from France was annulled by that body. He returned to France, but did not take his seat, in consequence of the political feeling of the country and the request of M. Thiers. In Oct., 1871, he was elected president of the council-general of the Oise. In Dec., 1871, he was elected a member of the French Academy, but did not take his seat till April, 1873. In March, 1872, he resumed his place in the army as general of division, and, although he continued to be a member of the Assembly, he took but little part in its deliberations, his principal speech being on the formation of the court-martial to judge Marshal Bazaine, when he declared he "would do his duty as a soldier, however painful it might be." He presided over this court-martial in Oct., 1873, preserving a severely patriotic attitude, though, after the condemnation of the accused, he was one of the first to recommend him to mercy and to procure a change of his sentence from death to banishment. In the same year he was made commander of the Seventh army corps. After the dismissal of MacMahon from the presidency, the duc d'Aumale was, in Feb., 1879, made inspector-general of the army. He is the author of several literary works, the most important being a *Histoire des Princes de la Maison de Condé* (1869), which was translated into English in 1871. He has written also several pamphlets and contributed to periodicals on historical and military subjects.

AURELIANUS, CLAUDIUS LUCIUS VALERIUS DOMITIUS (214–275), a Roman emperor, was born of obscure parents at Sirmium, in Pannonia, Sept. 9, 214. At an early age he entered the Roman army as a common soldier. Being tall, brave, and of remarkable strength, he became noted for his exploits, and acquired the name of "Sword-in-hand" (*Aurelianus manu ad ferrum*). He served in various parts of the empire, and rose successively to the rank of centurion, tribune, prefect of a legion, inspector of the camp, general of a frontier, and commander of the cavalry. His strictness in enforcing the minutest articles of discipline did not prevent him from securing and retaining the affection of his soldiers. He gained also the favor and confidence of the emperor Valerian, who made him consul in 256. Being adopted by Ulpius Crinitus, an eminent senator, whose daughter he is supposed to have married, he obtained an ample fortune. On the death of the emperor Claudius in 270, the army of the Danube proclaimed Aurelian emperor, and Quintilius, the brother of Claudius, who had also assumed the purple, committed suicide after a reign of a few weeks. The Goths had long harassed the frontiers of the empire, but Aurelian secured a lasting peace by relinquishing to the barbarians the province of Dacia, north of the Danube, while he assigned to the Roman inhabitants of that region fertile lands south of that river. The Alemanni and some other German tribes invaded Italy in 271, but Aurelian intercepted them on their return with their booty. Finding the roads back to Italy less strongly guarded than those towards their home, these barbarians boldly renewed the invasion, and the emperor, who had left their capture to his subordinates, was obliged again to join in the pursuit. After several battles, the Alemanni were completely defeated near Pavia. The great increase of the city of Rome, and the evident danger to which it was exposed from such bold incursions, led the emperor to commence the erection of new walls, which were finished in the reign of his successor, Probus, and are said to have been more than twenty miles in circuit. Aurelian next turned his arms against the famous Zenobia, queen of Palmyra, who after the death of her husband, Odenathus, had maintained, and even enlarged, the extensive empire in the East which she had assisted in establishing. After two severe defeats by the Romans, the first near Antioch, the second near Emesa, she was obliged to retire within the walls of her capital. In spite of the difficulty of transporting supplies through the Syrian deserts, Aurelian pressed the siege until the city surrendered, Zenobia having previously been captured while attempting to escape beyond the Euphrates. Longinus, the eminent critic, who had been one of her councillors, was put to death by the conqueror. The Palmyrenes, though treated with lenity, rose in revolt after Aurelian's departure and massacred the little Roman garrison left among them. As soon as the emperor learned of their rebellion he hastened back, filled with fury, and destroyed the beautiful city, slaying the greater part of its inhabitants. He next subdued Egypt, where a merchant named Firmus had seized the supreme power. Finally, Tetricus, who for several years had held undisputed possession of Gaul and Spain, was compelled to submit to the emperor's power. Aurelian, on his return to Rome, celebrated his victories with a triumph of unusual magnificence, in which the treasures of the East and West were displayed, and in the long train of captives Zenobia and Tetricus were conspicuous. Aurelian exerted himself to restore order and discipline in the civil administration of the empire, but the harshness, and even cruelty, of his measures caused discontent. He was the first of the Roman emperors that openly wore a diadem. He had planned an expedition against the Persians, and was starting on it when a conspiracy was excited against him by his secretary Mnestheus, whom he had threatened with punishment, and he was assassinated near Byzantium, A. D. 275. The order of the events of his reign has been disputed by historians. The chief authority is Vopiscus. (See Gibbon's *Decline and Fall of the Roman Empire*, and Bernhardt's *Geschichte Roms von Valerian bis Diocletian*, Berlin, 1867.)

AUROCHS (Germ. *aeuerochs*, mountain-ox), a quadruped of the genus *Bison*, family *Bovidæ*, the cattle of Lithuania, *Bison bonasus*. (See BISON.)

This is the *bonasus* of the ancients, now for many years on the point of extinction, and only preserved from total extermination by the protection of royalty: it is supposed that merely a few hundred survive. The genus *Bison*, to which the aurochs, the American bison or "buffalo," and several fossil species belong, constitutes a division of bovine quadrupeds well distinguished both from *Bos*, which includes domestic cattle, and from *Bubalus*, the genus of true African and Indian buffaloes. Closer relatives are the yak (*Poëphaga*) and the species of gaur (*Bibos*). In the true bisons the short premaxillary bones do not reach the nasals, six bones therefore surrounding the external nares; the forehead is convex; the horn-cores spring more anteriorly than in *Bos*; the spinous processes of the dorsal vertebræ are longer; there is a peculiar conformation of the body, resulting from the great development anteriorly, in comparison with the small hind quarters.

The relationships of the aurochs to the American bison, while very close, do not warrant that specific identity which some authors have assumed to exist. Though it is an old blunder, well exposed by J. A. Allen, to imagine that the two differ in the number of their ribs, there are nevertheless good characters whereby they may be distinguished. The aurochs is rather larger, with a smaller thorax, larger and stronger pelvis, longer and thicker tail, and less shaggy fore parts. According to Allen (*Amer. Bisons*, 4to, Cambridge, 1876, p. 41), the more important difference consists in the chest of *Bison Americanus* being absolutely larger than that of *B. bonasus*, while the pelvis is very small and weak. The small compressed thorax and strong heavy pelvis of *B. bonasus* give a deceptive appearance of standing higher on its legs. Nor is there that difference in the declination of the dorsal line which has been described. *B. bonasus* appears to be an older form than *B. Americanus*, and to depart less from the common ancestry, *B. priscus* and *B. antiquus*. (E. C.)

AURORA, the principal city of Kane co., Ill., is on the Fox River, 38 miles W. of Chicago, on the Chicago, Burlington, and Quincy Railroad, which has several branches running from the city and large construction- and repair-shops in the city. The other industrial works comprise flour-mills, woollen mills, sash-and-blind factory, and factories for the production of silver plate, wood-working machinery, harrows, carpet-sweepers, and carts. Aurora has six hotels, six newspapers, three national banks, twenty-two churches, several schools, a good public library, a city-hall which cost $75,000, and the Holly system of water-works. Gas is used for general lighting, but in 1881 the streets were lighted by electricity, this being the first city in the world to adopt that system of street-lighting. Aurora was first settled in 1834, and, though highly improved, is practically out of debt, with $140,000 in the treasury. Population, 11,873.

AURORA, a city of Dearborn co., Ind., is on the Ohio River, 25 miles W. of Cincinnati, and on the Ohio and Mississippi Railroad. It is chiefly a manufacturing town, having railroad-car works, rolling-mills, several factories for the manufacture of barrels, furniture, etc., as well as distilleries and a large brewery. It has a national bank, a weekly newspaper, several churches and schools, and is surrounded by a rich agricultural country. Population, 4435, chiefly of American birth.

AUSTIN, the county-seat of Mower, co., Minn., is a flourishing town on both sides of Cedar River, crossed here by three bridges, and on the Iowa and Minnesota, Austin and Mason City, and Southern Minnesota divisions of the Chicago, Milwaukee, and St. Paul Railroad, 104 miles S. of St. Paul. It is the division station of these branches, has a large round-house, five hotels, a large creamery, plough and feed-mill factories, two flour-mills, and there are four other flour-mills within a few miles. Austin has three weekly newspapers, a large public school, six churches, and a fine court-house. Austin was laid out in 1855, and was incorporated as a village in 1868 and as a city in 1873. Population, 2305.

AUSTIN, the county-seat of Lander co., Nev., is the geographical centre of that State, and is in Pony Cañon, 6 miles E. of Reese River, at the base of the Toiyabe Mountains. It is connected with the Central Pacific Railroad, 92 miles distant, by the Nevada Central (narrow-gauge) Railroad. It has good county buildings, three churches, public schools, a weekly newspaper, fire department, water-works, and a large quartz-mill with twenty stamps. The Reese River silver-mines were discovered in May, 1862, and Austin was laid out in 1863. Since the discovery $20,000,000 worth of bullion has been produced; the ore averages $275 per ton. Population of Austin, 1679.

AUSTIN, the capital of Texas, is in Travis county, near the centre of the State, 165 miles W. of Houston and 225 miles W. N. W. of Galveston. It is on the left bank of the Colorado River, at the junction of the Western branch of the Houston and Texas Central Railway with the International and Great Northern Railway, and is the terminus of the Austin and North-western Railroad. The city is at an altitude of 550 feet, on a succession of rock-crowned hills, and is noted for its healthfulness and beautiful scenery. It is well laid out and handsomely built, chiefly of limestone from adjoining quarries. The streets are not paved, but are lighted with gas; there are water-works, an excellent fire department, and a park of 23 acres. The public buildings include the State Capitol, the U. S. land-office, and the county court-house. There are also a Masonic temple, two opera-houses, and other halls. Austin has two national banks, two other banks, two daily and seven weekly newspapers (two of which are German), twelve churches, several good private as well as public schools, and three female colleges. It is also the seat of the State University of Texas, and contains the State asylum for the insane, blind, deaf and dumb. The chief shipments of the city for 1881 were: cotton, 24,000 bales; wool, 975,000 pounds; hides, 230,000 pounds; cotton-seed, 50,000 bushels; besides 15,000 cattle, sheep, and horses, as well as hay, pecans, and cedar-wood, making a total value of $1,500,000. The industrial works comprise several planing-mills, three foundries, soap-factory, broom-factory, cotton-seed oil-mill, ice-factories, flour-mills, and a tannery. In 1837 the place (then a hamlet called Waterloo) was selected as the State capital, and named Austin in honor of Moses Austin, the first projector of the American colonization of Texas. It was incorporated as a city in 1839, but in 1842, Pres. Sam Houston, thinking it too much exposed to attacks by Mexicans and Indians, endeavored to remove the capital to Houston. The people of Austin resisted, and, after what is called "the Archive War," succeeded in retaining the archives of the land-office. When Texas was annexed to the United States in 1845, Austin remained the capital. Its prosperity increased until the War of the Rebellion, when its growth was checked, its trade and industries depressed. Only in 1871 did it begin to revive, when the first railroad was built to the city. In the same year the first free schools in Texas were opened in Austin. Its property is valued at $5,500,000, its public debt is $115,000, and its annual expenses about $40,000. Population, 11,013, of whom 1385 are of foreign birth and 3606 colored.

AUSTIN, Moses (1764?–1821), an American pioneer, was born at Durham, Conn., about 1764. He became a merchant in Philadelphia, and subsequently purchased some lead-mines at New River, Wythe co., Va., where he established a manufactory of shot and sheet lead. In 1797 he explored parts of the present State of Missouri, and two years later he removed to Mine-à-Burton, having obtained a concession from the Spanish Government, to which that territory then belonged. Here he again engaged in mining lead and manufacturing shot, and acquired considerable wealth, but the failure of the Bank of St. Louis swept away his fortune. Resolving then to plant a colony in Texas, he went in 1820 to San Antonio de Bexar, where he was at first received ungraciously, but afterwards, with the aid of Baron de Bastrop, obtained permission from the Spanish authorities to colonize 300 families in Texas. On his return journey he experienced great hardships, but reached his daughter's home in Missouri, where he died June 10, 1821. His project was carried out by his son Stephen.

AUSTIN, Stephen Fuller (1793–1836), the founder of the State of Texas and son of Moses Austin, was born at Austinville, Wythe co., Va., Nov. 3, 1793. He took up his father's enterprise, and, arriving at San Antonio, Aug. 10, 1821, was acknowledged by the Spanish governor as successor to the rights and privileges of his father. After exploring the country he selected the region between the Brazos and Colorado rivers as most suitable for his purpose. He returned to New Orleans to gather a company of settlers, and in December the first party began the settlement on the present site of Austin. In consequence of the Mexican declaration of independence, Austin was now obliged to visit the city of Mexico to secure from the new government a confirmation of the grant made to his father. After various delays he obtained from the emperor Iturbide a decree to that effect, dated Feb. 18, 1823, and again, after the downfall of the emperor, a similar decree from his successors, dated April 14, 1823. In July, Gov. Garcia bestowed the name San Felipe de Austin on the town which was to be the capital of the colony. Austin was made a lieutenant-colonel, and invested with ample powers for the civil and military government of the colony. He was authorized to import supplies through the port of Galveston, and by his generous and prudent management the new settlement prospered. Large numbers of immigrants were attracted from the southern part of the United States, and other colonies were established under a general law. Texas for some years was politically attached to the Mexican state of Coahuila, but the growing power of the American colonists caused them to be dissatisfied with the arrangement and to take measures for admission into the Mexican Union as a separate state. At a convention held at San Felipe in April, 1833, a state constitution was framed and adopted, and Col Austin was sent as a commissioner to Mexico to urge upon the central Government the expediency and necessity of acceding to the request of the people. After long delay in consequence of the anarchy and revolutions among the Mexicans, he seemed on the point of succeeding, when a letter was published in which he had advised the corporations of Texas to form an independent local government, even if the central Government should refuse its consent. He was already on his way back to Texas when he was arrested, carried to Mexico, and imprisoned in the old dungeons of the Inquisition. Here he was detained from February to June, 1834, and at first treated with the utmost rigor, not being allowed to correspond with any one. Afterwards he was transferred to another prison, where he was treated more humanely, and was finally released after thirteen months' imprisonment. On his return in Sept., 1835, he urged the people of Texas to maintain their constitutional rights and resist the despotism of the central Government under Gen. Santa Anna. Committees of safety were formed by the colonists, and on the approach of the Mexican general Cos an army was organized and Austin elected commander-in-chief. Before any important military movement had taken place he was appointed a commissioner to the United States to obtain the recognition of Texas as an independent State. In the following summer he was nominated by his friends for the presidency of Texas, but Gen. Sam Houston was elected, and Gen. Austin was then made secretary of state. He died at Columbia, on the Brazos, Dec. 25, 1836.

AUSTRALIA. Since 1872 there have been a number of expeditions across the previously little-known interior of Australia, which have greatly added to our knowledge of its topography and physical features. The explorations of Mr. Ernest Giles in three expeditions, Mr. Gosse, Col. Egerton Warburton, Mr. A. Forrest, and others, between 1872 and 1876, were occupied wholly with the western half of the island-continent from the 112th to the 138th meridian E. longitude, and from the 20th to the 35th parallel of S. latitude. The explorations of Sturt, Leichardt, McDouall Stewart, and others in Central and Northern Australia have been supplemented by Mr. A. C. Gregory in two expeditions, one of them connecting with that of Col. E. Warburton at Mount Wilson, lat. 20° 30′ S., long. about 128° E., and in 1872 by the establishment of a telegraph line from Georgetown, Tasmania, to Adelaide, and thence almost due north across the continent to Port Darwin on Clarence Strait, in lat. 10° 30′. To these was added in 1879 an expedition from Queensland, which proceeded nearly due north-west from the Barcoo River to the telegraph station north of the Ashburton Range, in lat. about 16° S.

See Vol. III. p. 89 Am. ed. (p. 103 Edin. ed.).

The result of these numerous expeditions has been to make the public familiar with the general physical features of the central and western portions of Australia. While the coast, for a distance varying from 10 to 250 miles, comprises a considerable amount of arable and fertile land, and much more which is admirably adapted for grazing, more than one-half of the entire continent is an utterly uninhabitable desert—not, for the most part, covered with drifting sands; but, while generally arid, it is occasionally subject to the most extraordinary floods, which convert the extensive salt lakes and marshes into vast inland seas. The greatest obstacle to any settlement is found in the character of the vegetation which covers almost the entire country. This vegetation, though known as "scrub," is of several kinds, occupying different regions, but equally prolific on the sandy soil and without water, in a summer temperature which sometimes reaches 127° Fahr. in the shade. These various kinds are (1) the "Mallee scrub," a dwarf eucalyptus (*E. dumosa*), attaining a height of 12 or 14 feet without branches, and then forming a bushy head. The stems of these grow so closely together that there are often ten or twelve to a square foot of ground. When a road is cut through this scrub, it appears like a deep trench or as if enclosed by high walls, and if neglected for a single year, it is closed up by the spreading plants so as to be impassable. The "Mallee scrub" is found almost exclusively in the southern half of Australia, where it covers an expanse of more than 100,000 square miles. There are single tracts in the south-eastern part of South Australia of 9000 square miles covered with this scrub without a break. (2) Still more dreaded by the explorer or traveller is the "Mulza scrub," consisting chiefly of bushy acacias. These grow in spreading, irregular bushes, armed with strong spines or thorns, and where matted with other shrubs form a mass of vegetation through which it is impossible to penetrate. This is a much less common "scrub" than the "Mallee," or the labor of the explorer and pioneer would be still more severe than it now is. Other "scrubs" are formed chiefly by the *Melaleuca*, or "tea tree" of the colonists, which does not grow in such dense masses as the preceding, and with its fragrant and beautiful flowers. though troublesome, is one of the least disagreeable of the scrubs which occupy so much of the interior of Australia. (3) Next in extent to the "Mallee scrub" is the country occupied by dwarf shrubs, generally known as "heath." This usually consists of vast, level, sandy tracts, dusty in summer and boggy in winter, supporting no grass and but a few stunted trees, and everywhere covered with a tangled mass of woody vegetation about two feet high. In the spring these shrubs, which include many of our choicest greenhouse plants, present a beautiful appearance from their varied and bright-colored flowers, among which are mingled many larger flowering shrubs, especially of the *Melaleuca* and *Banksia* genera. (4) But the most terrible of all the vegetable pests of the interior of Australia is the "spinifex," or porcupine-grass (*Triodia irritans*), a rank and stiff grassy shrub, which has thorns and prickles in all directions, and which is greatly dreaded by horses and camels. The constant pricking of this grass causes raw and bleeding swellings around their feet, and so great is the torture produced by it that, to escape from it, they will prefer to force their way through the densest scrubs where the ground is soft and the spinifex does not grow. This is the most serious obstacle which the explorer and traveller encounter in their attempts to penetrate into this vast desert, for the spinifex covers a larger area of the desert lands than all the other scrubs together, and where the "Mallee scrub" alternates with it, the frantic horses, plunging into that, sweep off alike rider and load, and are frequently lost for days, and so bruised and wounded as to be unfit for travel.

The desert is not only intensely hot (exceeding in this respect any other portion of the globe), but it is, except in occasional oases very remote from each other, absolutely without potable water in ordinary seasons. The lakes and holes in which water stands during the dry season have only salt, alkaline, and nauseous compounds, which are so poisonous that neither men nor animals can drink them; and when, once in eight or ten years, there comes a terrible downpouring of rain, and the ordinarily small lakes and marshes become vast and wide seas, the waters are still turbid and brackish and the whole country is impassable.

But, though the latest explorations make it certain that more than one-half of this island-continent is thus uninhabitable, even by the careless and brutish aborigines, whose numbers are fast dwindling, and who in a few years will surely become extinct, there remain about 1,400,000 square miles of good arable or grazing lands, exclusive of small districts which are rich in mineral wealth. The eastern, south-eastern, and southern coasts seem to possess the most desirable of these lands, though Western Australia, along the coast and for a considerable distance inland, possesses magnificent forests, and its numerous bays and inlets abound in mollusks, among which the pearl-oyster is prominent.

Northern Australia, west of the great Gulf of Carpentaria, has bold, rocky shores and extensive tablelands or highlands, which are generally very fertile, especially on their northern slopes, though not so well watered as might be desired. Through these tablelands, which are from 1500 to 2000 feet above the sea, some of the summits reaching 2500 feet, the Alligator River and other streams have cut gorges or cañons to a depth of from 1000 to 1500 feet. Similar gorges are found in the Blue Mountains, in New South Wales, not far from the S. E. coast. The plateau here reaches a height of from 4000 to 5000 feet above the sea, and the cañons and precipices of Govat's Leap, said to be the deepest in Australia, range from 1000 to 1500 feet. Mount Kosciusko, in the Australian Alps or Warragong Mountains, just within the borders of New South Wales, is the highest elevation of the continent. A recent measurement makes its height 7308 feet.

The largest river is the Murray, which, with its two great affluents, the Darling and the Murrumbidgee, may be compared to the Mississippi and Missouri in length, though not in navigability.

Geology and Mineralogy.—There is nothing to be added to the description of the flora or fauna of Australia in the ENCYCLOPÆDIA BRITANNICA, and very little to the geology and mineralogy. Coal, either of the Palæozoic or Mesozoic formation, has now been discovered in all the colonies, but is most largely mined in New South Wales, Queensland, Victoria, and Tasmania. There are abundant fossils of fruits and animals, both in the Mesozoic and Tertiary formations, and many of the latter closely allied to existing genera and species in the Quaternary or Post-Pliocene deposits. These later fossils are all of Australian families of animals, thus demonstrating the great geological age of the Australian continent. The gold-fields of Australia are all in the Tertiary. Victoria, New South Wales, Queensland, and Tasmania have the principal gold-mines and placers, and the same colonies yield tin in large quantities. The product of the tin-mines in 1876 was nearly $3,000,000. South Australia produces large quantities of copper, the ores being rich and easily worked. The copper-product, mainly from South Australia and New South Wales, in 1876 was about $2,200,000. The amount of coal mined in New South Wales, Queensland, and Tasmania is increasing every year. In 1876 the coal-product of New South Wales alone was over 1,250,000 tons; in 1881 the entire product of Australia was estimated at nearly 3,000,000 tons. There are also mines of antimony, bismuth, cobalt, zinc, manganese, sulphur, and bitumen.

The timber trade from Queensland is large and increasing, and Western Australia produces a very fair ship-timber—the jarrah-wood, which does not rot and which the teredo or timber-borer will not touch. Sandal-wood, so highly prized in the East, also grows in great abundance in that colony. Tasmania has a great profusion of the finest cabinet woods, and also large quantities of excellent ship-timber.

Agricultural and Grazing Lands.—Of the vast amount of agricultural and grazing lands which are left in Australia after deducting all the deserts, mountains, lakes, etc.—an amount probably not less than 900,000,000 acres—but a very small portion is, as yet, utilized in any way. The cultivated lands in all the colonies in 1882 were estimated at only 6,955,952 acres; the pasture-lands, in the lavish use of them practised by the stockmen, may have amounted to fifteen times as many acres, but the whole area actually occupied by the colonists could not, in any event, have exceeded 100,000,000 acres; and nine-tenths of this was occupied with sheep- and cattle-ranges, while the same amount of stock could have been easily supported on one-fourth the area. Yet the live-stock and products on this area for the year 1881 were—65,915,024 sheep, 9,645,564 cattle, 1,014,423 horses, 248,091,118 pounds of wool, about 27,604,000 bushels of wheat, and nearly half that quantity of oats. About 2,000,000 gallons of wine were made, and from some of the colonies large quantities of sugar, rum, arrowroot, bêche-de-mer, preserved and fresh meats, oysters, pearl-shells, and timber were exported, as well as gold, copper, and tin, to the value of more than $10,500,000.

Telegraphs and Railroads.—The telegraph-wires in 1882 extended over 39,466 miles. One of these lines, in South Australia, extends across the continent from south to north, a distance of 2200 miles, and connects at the north with the submarine cable to England, thus bringing Australia into communication with all parts of the world. The greater part of its course is through the desert already described, and its stations, won from the Mallee and Mulza scrubs, are often the only human habitations within hundreds of miles. The railroad development of Australia has also been rapid and on a grand scale. In 1882 there were 4184 miles of railroad in actual operation, and 1146 miles more in course of construction, most of which are now completed. A line has been projected across the continent from east to west, from Sydney to Adelaide—a feasible route, and one which will utilize several roads already constructed, and follow for a long distance the valley of the Murrumbidgee. This will probably be constructed within the next four or five years. Another, not yet chartered, proposes to follow the telegraph line from south to north across the continent, but its termini are not yet sufficiently developed to give it much promise of a profitable traffic.

The following table, prepared from the latest official authorities, gives the principal statistics of the Australian colonies for 1881 and 1882. It includes Tasmania, which is as truly a part of Australia as the British isles are of Europe, besides the many minor islands which lie near the continent.

Australian Statistics.

Colony.	Date of organization, year.	Area, sq. miles.	Population, census of April 3, 1881.	Revenue, 1881–82.	Expenditures, 1881–82.	Public debt, Jan. 1, 1882.	Imports, 1881.	Exports, 1881.	Gold produced in 30 years, millions.
Victoria	1851	87,884	862,346	$27,961,810	$25,513,210	$112,132,510	$83,592,605	$81,260,515	$1,010,611
New South Wales..	1788	309,175	751,468	33,539,815	29,452,900	84,620,095	87,046,630	80,247,515	172,611
South Australia.....	1836	903,425	286,411	10,859,935	10,271,420	55,984,025	26,220,320	22,038,785	....
Queensland..........	1859	668,224	213,525	10,118,340	8,788,270	66,225,750	20,318,125	17,701,830	56,400
Western Australia.	1829	975,920	29,708	1,271,565	986,930	2,555,000	2,024,155	2,513,845	....
Tasmania	1825	26,375	115,705	2,529,360	2,313,065	10,015,000	7,155,720	7,777,880	16,100
Total................	......	2,971,003	2,259,163	$86,280,825	$77,385,795	$331,532,380	$226,357,555	$211,540,370	$1,255,722

Colony.	Wool produced, pounds.	Number of sheep, 1881.	Land under cultivation, acres.	Number of horses, 1881.	Number of cattle, 1881.	Railroads in operation, miles.	Railroads under construction, miles.	Telegraph lines in operation, miles.	Leading products.
Victoria	45,970,560	10,360,285	1,821,719	275,516	1,286,267	1247	159	6,626	Gold, wool, wine.
New South Wales..	123,742,458	33,062,854	645,068	346,931	2,180,896	1041	573	14,278	Wool, gold, coal, wine.
South Australia.....	27,316,000	6,810,856	2,613,903	159,678	314,918	832	161	7,227	Wool, copper, wheat, wine.
Queensland..........	36,218,000	8,292,883	128,075	194,217	3,618,513	800	233	8,585	Wool, timber, gold, grain.
Western Australia.	9,120,000	1,267,912	53,353	31,755	63,009	92	20	1,593	Jarrah-wood, sandal, pearls.
Tasmania	5,724,100	1,817,479	374,374	27,805	130,526	172	......	1,157	Wool and sheep, gold, tin, fruit, coal, and timber.
Total................	248,091,118	61,642,269	5,636,492	1,035,902	7,594,129	4184	1146	39,466	

The other agricultural statistics of Australia in 1881–82 were—wheat produced, 21,378,009 bushels; oats, 4,793,416 bushels; barley, 1,341,421 bushels; maize, 6,326,050 bushels; other cereals, 828,228 bushels; potatoes, 242,872 tons; hay, 1,438,060 tons; sugar produced, 540,000 cwt.; oranges, 5,309,000 dozen; pineapples, bananas, cotton, etc.

Those who desire to study the Australian colonies further may consult Col. Warburton's *Journey Across Australia,* edited by H. W. Bates and C. H. Eden (1875); *South Australia, its History, etc.,* by William Harcus (1876); *Victorian Year-Book,* by Henry Heylyn Hayter (1879 and the following years); *Australian Dictionary of Dates and Men of the Time,* by J. H. Heaton (1879); *Travels in Central Australia,* by Ernest Giles (1875), and "Journey from South to West Australia," in *Journal* of the Royal Geographical Society, by Ernest Giles (1876); *Explorations in Australia,* by A. Forrest (1875); Sir J. D. Hooker on *Flora of Australia* (1878); "Australasia," one of the volumes of Stanford's *Compendium of Geography and Travel,* edited and extended by Alfred R. Wallace, F. R. G. S. (1880); *Whitaker's Almanac for 1883; The Official Directory of Australia for 1883.* (L. P. B.)

AUSTRIA, THE EMPIRE OF, OR AUSTRIA-HUNGARY.

See Vol. III. p. 100 Am. ed. (p. 115 Edin. ed.).

Under this title we propose to supplement the article AUSTRIA, OR AUSTRIA-HUNGARY, in the main work, in all particulars relating to the empire and the German or Cisleithan monarchy, often designated as Austria proper, but not to treat, except incidentally, of matters pertaining solely to the kingdom of Hungary, which will form a separate article. (See HUNGARY in the Supplement.) There are no additions necessary in the topography, except those involved in the annexation of the late Turkish provinces of Bosnia and the Herzegovina. Bosnia and the duchy are south of the Danube. Bosnia extends from Croatia to Servia, and the Herzegovina from Croatia to Montenegro, lying between Dalmatia and Bosnia. The whole territory of the two provinces occupies 20,725 square miles, with a population of 1,070,172, and gives Austria a much more complete and defensible frontier, as to Servia, Turkey, and Montenegro, than she previously had. (For the topography of these provinces see BOSNIA.)

The extensive forests in both the Cisleithan and Transleithan portions of the empire abound in every description of wild game. The report of the Austrian minister of agriculture for 1880, showing the quantity of game killed in the Cisleithan provinces alone during that year, states that 1,027,000 head of ground game were shot, including 22,000 foxes, 12,000 weasels, 6000 martens, 2300 badgers, 165 wolves, 65 lynxes, 25 bears, 930,000 hares, 42,000 deer, and 27,000 rabbits. Of feathered game, 992,346 head were shot, including 717,000 partridges, 84,000 quails, 78,000 pheasants, 43,000 wild-duck, and 25,000 woodcock and snipe. The forests of Hungary and Transleithan Austria yielded still greater quantities of the larger game.

The composite and heterogeneous character of the Austrian population, of which we have spoken more fully elsewhere, renders it very difficult to reconcile so many conflicting interests. Much of what, to an outsider, appears to be a tendency to vacillation in the imperial policy is due to the jealousies of these diverse nationalities.

In 1875, when our record commences, and still more in 1876, there were heard the first mutterings of the thunder which was to culminate in a fierce war between

Russia and Turkey. Between the two great powers so soon to be arrayed in conflict lay Eastern Austria, Servia, and the Roumanian principalities, which, though tributary to the sultan, were almost wholly under the influence of Russia. The Austrian emperor looked with undisguised dread and anxiety upon this condition of affairs. The kingdom of Hungary and the provinces of Croatia, Slavonia, and Transylvania, all occupied by either Sclavic or Tartar races, stretched eastward to the Moldavian boundary, and, whatever might be the result of the war which was pending, it seemed impossible to keep these races out of it. Hungary had her Tartar or Turcoman blood, as well as the remembrance of deeds of kindness done her by Turkey when she was in distress, to prompt her to join hands with the Turks, while all the Sclavonic races were disposed, under the influence of Russian emissaries, to take part with Russia, whose nobles and people were of Sclavonic origin. The cruelties practised on the Bosniacs in 1875, and the horrible outrages committed by the Turks in Bulgaria in 1876, had roused these Sclavonic provinces to fury, and they were demanding that the Turks should be expelled from Europe at once. The Austrian emperor exerted all his influence with Russia and with Turkey to prevent war, and finally induced the Russian emperor to join him in overtures for a peaceful settlement of the grave difficulties of the situation. Count Andrássy, the premier of Austria, himself a Hungarian by birth, and one of the ablest statesmen of Europe, on the 25th of Jan., 1876, before the Bulgarian outrages, drew up a note addressed to the two powers, but especially to the Ottoman Porte, demanding certain reforms from Turkey, and promising to sustain her if she would carry them out in good faith. These reforms were the following: (1) Religious liberty, full and entire; (2) abolition of the farming of taxes; (3) a law to guarantee that the direct taxation of Bosnia and the Herzegovina should be employed for the immediate interests of the provinces; (4) a special commission, composed of an equal number of Mussulmans and Christians, to superintend the execution of the reforms proclaimed and proposed; (5) the amelioration of the condition of the rural population. This note and the measures of reform were heartily supported by the representatives of the six powers, and were not rejected by the grand vizier, Midhat Pasha, who replied that he was preparing a constitution which would embody these and other measures of reform. But this constitution was not sustained by the sultan, and the practical reply to the propositions of the Austrian premier was the horrible butcheries and outrages perpetrated in Bulgaria in May and June, 1876. Further negotiations were attempted with the sultan, but they were of no effect; and the brief, unwise, and indecisive war of Servia and Montenegro against Turkey in the summer of 1876 only served to render the Turkish Government more incorrigible. The sultan defied all the powers of Europe, and even, with murdered dead of the Bulgarian massacre as yet unburied, proclaimed his own innocence and purity, and laid all the blame of the act on Russia. The war followed, commencing in March, 1877, and virtually terminating in Jan., 1878. The perils to which the Austrian empire was exposed in this war compelled the Government to maintain a large army of observation on the whole frontier, and to interfere actively for the protection of Bosnia and Montenegro and its own provinces of Croatia and Dalmatia. By the preliminary treaty of San Stefano, concluded March 3, 1878, Turkey seemed willing to relinquish everything to Russia. This treaty only stipulated that the reforms demanded by Count Andrássy two years before should be granted to Bosnia and the Herzegovina, and that any complaints made by the people should be referred to Austria-Hungary and Russia for adjudication, but gave Austria no claim upon Bosnian territory. This, as well as several other stipulations of the treaty of San Stefano, was not satisfactory either to Austria-Hungary or to the other European powers, and a congress of the powers was subsequently called at Berlin, June 13, 1878, which materially modified many of its provisions. By this treaty of Berlin it was decided that "the provinces of Bosnia and the Herzegovina should be occupied and administered by Austria-Hungary." To carry this measure into effect required great exertion and expenditure on the part of the Austrian empire. At the conclusion of the congress which formulated the treaty, and its ratification by the powers, Count Andrássy succeeded in obtaining from the two Parliaments (Austria and Hungary) a grant of $6,000,000 for the pacification of Bosnia; and after much hesitation the advance of the army was ordered. On the 8th of Aug., 1878, severe opposition was encountered by the army, which had then reached Tuzla, and the Hungarian general Szapary's column was forced to retreat. From three centres the insurrection spread in every direction. The Mohammedans made a last stand and fought desperately, and the main body of the Austrian army was compelled to halt and wait for reinforcements. Several additional corps were mobilized, and after a delay of several weeks the Austrians drove their foes from valley to valley until the last stronghold was occupied. When the revolt had finally collapsed, late in September, measures were taken for the organization of a civil government, and Austria added another to the number of nationalities which she had succeeded in pacifying and agglomerating into one composite whole; but the loss of blood and treasure had been very great. This Bosnian campaign had cost the empire, already heavily burdened with debt, 100,000,000 florins, or $20,000,000, but it had given her additional fertile territory, with a population largely Sclavonic, and a better and safer frontier.

Since the beginning of 1879 there has been no serious trouble in Bosnia. Some slight outbreaks where the Mohammedans were in the majority were inevitable, but these have been very promptly suppressed. The Greek Catholics (Greek only in their allegiance to the Orthodox Greek Church) have been placed by the emperor under the control of the patriarch of Hungary, and the Roman Catholics of course under the Roman Catholic hierarchy of the empire. The Protestants of Bosnia, of different creeds but of small numbers, have no recognized hierarchical head or leader, but there is a moderate degree of toleration.

The unwillingness of the Turkish Government to submit in good faith to the provisions of the Treaty of Berlin, the threatened war between Greece and Turkey, the naval demonstration of the powers which was found necessary to compel the surrender of Dulcigno to the Montenegrins, the attempted independence of Albania, and the entire neglect of the treaty stipulations concerning the provinces of Asia Minor, have given Austria, as her nearest powerful neighbor, much anxiety, and have rendered necessary the maintenance of a larger military and naval force than the condition of her finances quite justified.

The internal administration of the empire has been as successful since 1875 as was possible where the interests of the various nationalities were so diverse, and the country has been improving in material development and wealth, in the extension of its industries and commerce, in its educational facilities, and in an increased toleration and liberty of conscience. The International Exposition at Vienna in 1873 aided largely in developing the manufacturing and agricultural interests of the empire, and in bringing it into more intimate relations with other nations. That of 1882, devoted specifically to art matters, has also proved beneficial to the artistic development of the country. The burning of Serajevo, the capital of Bosnia, in 1879, and the occurrence of terrible floods in Hungary in 1880, and again in 1882, called forth the sympathies of the people of the empire, and made more evident the brotherhood of all races.

Education.—There has been a very great improvement in primary and secondary education in the empire within the last seven years. The Teutonic or Germanic provinces adhere very strictly to the decrees of 1848 and 1849 making attendance in the *Volks-Schulen*, or national schools, compulsory on all children between the ages of six and twelve, and holding parents punishable for any neglect. The Sclavonic and Hungarian provinces have not yet fully complied with these decrees, but they are improving. Of late years the state has come forward to assist in the establishment of schools for primary education, which had previously been sustained wholly by the communes. There are now 7 universities and 66 gymnasia in the empire. The universities are at Vienna, Prague, Grätz, Innspruck, Cracow, Czernowitz (1875), and Lemberg. In 1879 the University of Vienna had 246 teachers and 3975 students; the University of Pesth (Hungary), 127 teachers and 1979 students; and the University of Prague (Bohemia), 129 teachers and 1592 students. None of the other universities had over 800 students in that year. The 66 gymnasia had 1535 teachers and 14,542 students in 1876.

FINANCES.—(1) *Public Debt.* On the 1st of July, 1881, the debt of the whole empire, exclusive of the special debt of Hungary, was as follows:

Description of Debt.	Florins.	Dollars.
Consolidated debt, bearing interest	2,914,358,160	1,457,179,080
" " without interest	116,768,481	58,384,240
Floating debt	119,018,664	59,509,332
Floating debt, with interest in paper money	411,999,067	205,999,534
Annuities	14,298,701	7,149,350
Total	3,576,443,073	1,788,221,536

The total annual interest on the debt amounted in 1881 to 114,498,340 florins, or $57,249,170. The special debt of Hungary amounted at the end of Dec., 1878, to 434,000,000 florins, or $217,000,000, and in 1881 had reached $254,151,265.

(2) *The Revenue and Expenditure Annually.—a. For the Whole Empire.* Austrian Government bookkeeping was always a mystery of intricacy, but of late years it has become more mysterious than ever. The following is the budget for the year 1880, though a comparison with the budget of 1879 leads us to believe that it does not represent more than two-thirds of the actual revenue or expenditure:

1. *Revenue.*

Sources of Direct Revenue.	Florins.	Dollars.
Ministry of foreign affairs	4,159,490	2,079,745
Ministry of war { army	123,653,060	61,826,530
Ministry of war { navy	8,709,780	4,354,890
Ministry of finance	889,550	444,775
Board of control	125,500	62,750
Receipts from customs	97,331,364	48,665,682
" from other sources	5,815,125	2,907,562
Totals	240,683,869	120,341,934

2. *Expenditures.*

Branches of Expenditure.	Florins.	Dollars.
Ministry of foreign affairs	4,150,490	2,075,245
Ministry of war { army navy }	129,312,420	64,656,210
Ministry of finance	1,889,550	944,775
Board of control	125,500	62,750
Deficit assessed, 70 per cent. on Austria proper, and 30 per cent. on Hungary	89,438,655	44,719,328
Totals	224,916,615	112,458,308

There is probably some item of expenditure, amounting to nearly $8,000,000, omitted, but the official statements give no hint of it.

b. Revenues and Expenditures of the Cisleithan Monarchy, Austria Proper. According to the budget these have been as follows for each year since 1875:

Years.	Revenue.		Expenditure.	
	Florins.	Dollars.	Florins.	Dollars.
1875	373,089,890	186,544,945	382,231,040	191,115,520
1876	378,949,940	189,470,970	403,869,870	201,934,935
1877	376,637,810	188,318,905	405,569,470	202,784,735
1878	399,795,160	199,897,580	423,121,700	211,560,850
1879	392,565,140	196,282,570	471,163,650	235,581,825
1880	399,995,770	199,997,885	412,712,910	206,356,455
1881	409,645,990	204,822,995	463,112,260	231,556,130

The sources of revenue are—direct taxes, customs duties, excise (or, as we should say, internal revenue), duties, stamps, judicial fees, monopolies on salt and tobacco, a state lottery, state domains and railways, post and telegraphs, and miscellaneous receipts. The branches of expenditure were as follows for the year 1881:

Branches of Expenditure.	Florins.	Dollars.
Imperial household	4,650,000	2,325,000
Imperial cabinet chancery	70,600	85,300
Reichsrath (Parliament)	1,466,960	733,480
Council of ministers	904,160	452,080
Ministry of the interior	17,864,924	8,932,462
" national defence	9,532,407	4,766,203
" public education and worship	15,921,542	7,960,771
" agriculture	11,573,605	5,786,803
" finance	93,137,758	46,568,874
" justice	20,963,736	10,481,868
" commerce	29,888,660	14,944,330
Board of control	154,000	77,000
Interest on public debt	135,944,473	67,972.236
Pensions and grants	36,746,100	18,373,050
Cisleithan portion of the common expenditure of the empire, including war and foreign affairs	83,293,379	41,646,690
Total expenditure	462,112,394	231,056,147

We add, for the purpose of comparison, a similar statement concerning the Hungarian or Transleithan monarchy. The budget estimates of revenue and expenditure of Hungary in each of the six years from 1876 to 1881 were as follows:

Years.	Revenue.		Expenditure.	
	Florins.	Dollars.	Florins.	Dollars.
1876	225,424,680	112,712,340	240,742,050	120,371,025
1877	218,339,490	109,169,745	233,410,420	116,705,210
1878	219,846,110	109,923,055	239,361,430	119,680,715
1879	222,208,600	111,104,300	256,436,380	128,218,190
1880	236,350,290	118,175,145	253,669,660	126,834,830
1881	264,414,715	132,207,357	287,180,096	143,590,048

The deficit varied, it will be observed, from $7,340,000 to $17,100,000 in the different years, but there was always a deficit. The amount of deficiency has been made good by contracting foreign loans, creating a large special debt of the kingdom of Hungary. This debt amounted in Dec., 1878, to $217,000,000, and has since been increased to $254,000,000 in 1881.

ARMY AND NAVY.—In 1880 the standing army of Austria-Hungary was fixed at 800,000 men for the war-footing, and about 300,000 men for the peace-footing. The army is formed on the model of that of Prussia, on the system of universal liability to military service. The term of service is ten years, three of which the soldier must spend in active service, after which he is enrolled for the remaining seven years in the army of reserve, with further liability to serve two years in the Landwehr or militia. This Landwehr or militia embraces all able-bodied men of military age not enrolled in the standing army, and the Landsturm includes all able-bodied men under sixty and over forty-five years, who are only called into service in a great emergency. The actual force of the standing army in 1880 was 239,615 men on the peace-footing and 771,556 on the war-footing, divided as follows: infantry, 95 regiments, 33 battalions, and 12 companies on the peace-footing, 144,440; on the war-footing, 571,092. Cavalry, 30 regiments of dragoons, hussars, and lancers, peace-footing, 35,793; war-footing, 58,794. Artillery, 12 regiments and 14 battalions, peace, 25,658; war, 62,774. Engineers and train: 2 regiments of engineers, 1 of pioneers, and 54 squadrons of train; in peace, 9866; war, 45,134. Miscellaneous, including instruction, topographical survey, commissariat, sanitary, arsenals, and military police, in peace, 23,858; in war, 33,762. The staff, in active service, consisted of 2 field-marshals, 23 generals of infantry and of cavalry, 56 generals of division, and 110 generals of brigade; non-active, 7 generals of infantry and of cavalry, 81 generals of division, and 188 generals of brigade. Austria-Hungary has twenty-five fortresses of the first rank, including Pola, which is the chief naval fortress of the empire.

Navy.—At the end of 1880, Austria-Hungary's navy consisted of 14 armor-clad steamships; 37 other steamers, mostly of small dimensions, for coast defence; and 10 sailing ships. Of the armor-clad ships, 10 are of the first class, carrying 108 large Krupp guns; 1 is of the second class, carrying 10 guns; and 2 of the third class, with inch-and-a-half armor, and carrying 2 guns each. The naval force consists of 1 admiral, 2 vice-admirals, 5 rear-admirals, 16 captains of ships of the line, 17 captains of frigates, 18 captains of corvettes, 117 lieutenants, 232 ensigns and cadets, and 5771 sailors.

Area and Population of the Austrian Empire (Austria-Hungary) in 1881.

Provinces of the Empire.	Area, sq. miles.	Population, Jan. 1, 1881.
German Monarchy:		
Lower Austria (Unter der Ens).	7,654	2,330,621
Upper Austria (Ober der Ens)...	4,631	759,620
Salzburg	2,767	163,570
Styria (Steiermark)	8,670	1,213,597
Carinthia (Kärnten)	4,005	348,730
Carniola (Krain)	3,856	481,243
Coastland (Küstenland)	3,084	647,834
Tyrol and Vorarlberg	11,324	912,549
Bohemia (Böhmen)	20,060	5,560,819
Moravia (Mähren)	8,583	2,153,406
Silesia (Schlesien)	1,987	565,475
Galicia (Galizien)	30,307	5,958,907
Bukowina	4,035	571,671
Dalmatia (Dalmatien)	4,940	476,101
Total German monarchy	115,903	22,144,143
Kingdom of Hungary:		
Hungary proper	87,043	11,744,471
Croatia and Sclavonia	16,773	1,732,261
Transylvania (Siebenburgen)...	21,215	2,116,132
Town of Fiume	8	17,865
Total Hungary	125,039	15,610,729
Turkish provinces annexed 1878:		
Bosnia	16,417	862,202
Herzegovina	4,308	207,970
Total Turkish provinces	20,725	1,070,172
Total, Austria-Hungary	261,607	38,825,044

The small principality of Lichtenstein, enclosed in the Austrian province of Tyrol and Vorarlberg, having an area of 68 square miles and a population of 8320, belongs practically to Austria, though its inhabitants pay no taxes and are not liable to military service. The Austrian empire is a conglomerate of various nationalities, often with differing, and sometimes hostile, interests. The Austrian monarchy comprises, besides the Teutonic element, Poles, Bohemians (Czechs), Moravians, Slovacks, Ruthenians, and Dalmatians—peoples as purely Slavic in race and language as any in existence. The kingdom of Hungary has the Magyars and Czeklers, the Croatians, Servians, Slovens, and Slavonians, four Slavic races, and the Roumans, Italians, and Zingari or Gypsies—mixed races, but most of them with a preponderance of Slavic blood. The newly-acquired Turkish provinces, as well as some of the others, have Slaves, Turks, Greeks, and Albanians. Nor are the religious faiths less diverse. There is a predominance of Roman Catholics—nearly 69 per cent. in the whole empire, 80·4 per cent. in Austria and the German monarchy—15 per cent. of Greek Catholics, and 9 per cent. more of Byzantine Greeks, 11 per cent. of Evangelical Protestants, 3·3 per cent. of Jews, 1½ per cent. of Mohammedans, many of them of Sclavonic race, and a small percentage of Arminians, Unitarians, other sects, and Gypsies.

The natural increase of population in Austria-Hungary has not been large in recent years, owing to the very high death-rate among the population from wars, disasters, and fatal epidemics. The number of births, deaths, and marriages in Austria proper in 1876 was 874,623 births, 634,363 deaths, and 176,148 marriages—an excess of births over deaths of 240,260. This has not been equalled in any year since. In 1880 the number of births was 850,009; of deaths, 676,287; of marriages, 167,200—excess of births over deaths, 173,722. In Hungary in 1876 the number of births was 623,849; of deaths, 478,684; of marriages, 135,011—excess of births over deaths, 145,165. In 1879 (the last published report) the births were 724,428; deaths, 566,366; marriages, 162,188—excess of births over deaths, 158,062. There is a moderately large emigration from Austria, but very little immigration from other countries. The emigration from Austria-Hungary to the United States in the year ending June 30, 1882, was 29,161.

There are only eleven towns with over 50,000 inhabitants in Austria-Hungary; of these, seven are in Austria proper and four in Hungary. The capital of Austria and of the empire had a population on Dec. 31, 1880, of 726,105, not including the suburbs; including these the population was 1,020,707. Prague had 162,318; Trieste, 144,437; Lemberg, 110,250; Grätz, 97,727; Brünn, 82,665; and Cracow, 66,095, in Dec., 1880. In Hungary, Buda-Pesth had 359,821; Hold-mezö-Vásárhély, 74,094; Maria-Theresiopel, 61,655; and Szegedin, 50,983. The population of the larger towns is constantly increasing, but more than two-thirds of the population of the empire are engaged in agriculture.

The Germans (strictly Teutonic tribes) constituted 38 per cent. of the inhabitants in the German or Cisleithan part of the empire at the last census, and nearly 20 per cent. in the Hungarian or Transleithan part. The Sclavonic peoples formed 49 per cent. of the population in the Cisleithan and 16 per cent. in the Transleithan divisions. The addition of the Turkish provinces, whose inhabitants are mostly Sclavonian, increases the proportion of these peoples by nearly 5 per cent. The Magyars or Hungarians include 38 per cent. of the population of the kingdom of Hungary, and not quite $\frac{1}{10}$ per cent. of that of the German monarchy.

COMMERCE.—The imports and exports of merchandise, but not of bullion, for the whole empire except the province of Dalmatia—which is not within the imperial line of customs—from 1875 to 1879, both inclusive, was as follows:

Years.	Imports.		Exports.	
	Florins.	Dollars.	Florins.	Dollars.
1875	552,548,869	276,274,434	504,467,261	252,233,630
1876	516,964,350	258,482,175	509,658,721	254,829,361
1877	555,227,048	277,613,524	662,032,209	331,016,104
1878	579,547,828	289,773,914	698,302,513	349,151,257
1879	551,400,000	275,700,000	675,100,000	337,550,000

Nearly two-thirds of the whole commerce of the empire, both of imports and exports, is with Germany, and of the remainder much of what is destined for Western nations passes through Germany, and is popularly credited to German ports. Turkey also has a large commerce with Austria, its imports from that country being about $26,000,000 annually, and its exports thither average $15,000,000. Its commerce with Great Britain amounted in 1880 to $7,154,745 of exports and $2,967,805 of imports. Its commerce with the United

States in the same year was $1,555,007 of exports and $2,306,829 of imports. In 1882 these amounts were—exports, $2,444,812, and imports, $2,295,702. The principal exports are—coffee, which is, however, not the growth of Austria-Hungary; beet-sugar, one of its largest products; manufactured tobacco (both the growth and manufacture being Government monopolies); wheat and wheat-flour; maize, olive oil, alcohol, Hungarian wines, barrel-staves, building-stones, raw cotton, cotton goods, wool and woollen goods, silk and silk goods, clothing, and paper. There is also an increasing demand in other countries for the manufactures of fine sheet iron and the glass wares of Bohemia. The imports are not widely different from the exports—coffee, sugar, grain and flour, olives and olive oil, iron, raw and wrought, cotton, silk, flax, and wool, and manufactured goods of all these; agricultural machines, sewing-machines, petroleum, provisions, tobacco, raw and manufactured, etc., etc.

The manufactures of Austria-Hungary are increasing, and the goods of all descriptions are better than formerly. An international art exhibition was held in Vienna in the summer of 1882, which has given a new impulse to art and art-production.

The post-office department in Austria-Hungary in 1880 had 4025 post-offices in Austria proper, and 2301 in the kingdom of Hungary; 238,507,000 letters were transmitted through the Austrian, and 74,218,000 through the Hungarian offices; 43,934,400 post-cards through the Austrian, and 13,623,000 through the Hungarian offices; 6,553,000 patterns and parcels through the Austrian, and 1,976,000 through the Hungarian offices; and 75,318,350 newspapers and books through the Austrian, and 36,032,892 through the Hungarian offices. On the 1st of Jan., 1881, there were in Austria proper 21,735 English miles of telegraph lines, and 9032 miles in Hungary; at the same time there were 56,862 miles of wire in Austria proper, and 32,380 miles in Hungary. The telegraph carried, in 1880, 8,370,241 messages, of which 579,202 were official.

The *railway* development in Austria-Hungary has been slow. In 1879 there were only 11,255 miles of railway open for traffic, and 2630 miles more in course of construction. Within the past three years there has been considerable progress, and the total amount is said now to exceed 15,000 miles.

The *commercial marine* of Austria-Hungary is increasing. Its Austro-Hungarian Imperial Lloyds, established at Trieste, has a fleet of about 70 first-class steamers, and absorbs the greater part of the trade of Austria and some of that of the Western nations with the East. It is subsidized at the rate of $865,000 per annum by the imperial Government. The entire commercial marine of the empire in Jan., 1880, was officially stated as consisting of 75 sea-going steamers, of 16,655 horse-power and 62,101 tons of tonnage, manned by 2341 men; 38 coasting steamers, of 1133 horse-power, 1869 tons, and 245 men; 8079 sailing vessels, including coasters and fishing-smacks, with a tonnage of 267,468 tons and manned by 24,742 men. The totals of the commercial marine were 8192 vessels, 331,438 tons, 27,328 men. The principal ports are Trieste, Fiume, and Pola; there are some inferior ports on the Dalmatian coast. Austria-Hungary has now a free-navigation of the Danube, but its tonnage there is as yet small.

The *money* unit is the silver *florin* of 100 new kreuzer, which is worth about 48 cents; but practically the chief medium of exchange is a paper currency consisting of bank-notes of all denominations. The paper florin is worth only about 40·7 cents. The unit of *weight* is the *Pfund*, which is $1\frac{235}{1000}$ pounds avoirdupois; the units of measures are the *Metze*, $1\frac{7}{10}$ imperial bushels; the *Joch*, $1\frac{42}{100}$ acres; the *Klafter*, 67 cubic feet; the Austrian *Fuss*, or foot, $1\frac{37}{100}$ feet; and the *Eimer*, of $14\frac{94}{100}$ wine-gallons.

Those who desire further information may consult F. von Löher, *Die Magyaren und andere Ungarn* (1874); Comte de Müllinen, *Les Finances de l'Autriche* (1875); Dr. Alexander Peez, *Oesterreich und der Orient* (1875); Baron Henry de Worms, *The Austro-Hungarian Empire* (1877); Dr. L. P. Brockett, *The Cross and the Crescent* (1878); V. Prasch, *Handbuch der Statistik des Oest. Kaiserstaats* (1879); Frederick Martin, *Statesman's Year-Book* (1883), art. "Austria-Hungary" (1883); American Department of State, *Consular Reports for 1882*, many articles (1882); Laborde, *Voyage pittoresque en Autriche;* Steinhauser, *Geographie von Oesterreich;* the official *Fontes rerum Austricarum*, and *Archiv für Kunde österreichischen Geschichtquellen* (1848 sqq.). (L. P. B.)

AUTOBIOGRAPHY (Greek, αὐτός, self; βίος, life; and γράφειν, to write), the narrative of a person's life, written by himself. *Memoirs* deal more with the events and surroundings—autobiography with the personality of the writer. Such records are specially of value when they are written by men eminent in history, and frequently display characters widely different from those presented by history or by the hand of another biographer. They are pleasant to write because of their personality, and because the author unbends from severer studies and complicated labors to give play to his own idiosyncrasies. The motive is as various as the variety of the human mind—to instruct, to explain one's actions, to vindicate his course of action, to exculpate himself from certain charges or allegations, or it may be to acknowledge faults and to display penitence. Many autobiographies are thus in part confessions and apologies.

It will not be expected that exact truth is always to be found in such works; there is sometimes an intention to deceive, and oftener a temptation to suppress. It is human nature to keep back the shameful or obscure portions of one's life and to dwell too strongly upon the more honorable circumstances. Thus warned, the reader will make due allowance for these failings, and profit by those portions which bear the *primâ facie* air of truth.

Autobiography is pleasant to read, even more so than biography. We are brought nearer to the individual life of the writer, and our sympathy is greater; the narrative becomes the confidential disclosure of an intimate companion who shows us the secret workings of his heart. Familiar letters, not designed when written for the public eye, are autobiographical in character, but it should be observed that in later times men of station frequently write with a view to the future publication of their letters.

Many writers have left short but precious sketches of their earlier lives, abandoned when they became more famous. They seemed to look back to the brightness and peace of their youth with pleasure, and to feel also that as their later lives are illustrated and made clear by distinguished actions and works, it was the unknown and perhaps obscure period of youth which alone needed elucidation. Such are the fragments of Dante, of Scott (used by Lockhart in his biography), of Moore, Byron (in his journal), Southey, Hume, Alfieri, and Jean Paul Richter. Goethe's *Dichtung und Wahrheit* ("Poetry and Truth") is, as the name indicates, an idealized and poetic account of himself during this youthful period, and the description applies to many books of this class.

Autobiography is one of the earliest forms of composition. Of the scanty literature of ancient Egypt it constitutes a large part. In the inscriptions are found autobiographic records as early as the sixth dynasty, those of Una and Abeba. A papyrus of the twelfth dynasty gives us a romantic autobiography by a soldier named Sancha, and is supplemented by two important inscriptions of a similar character, those of Ameni and of Khnumhetp. Of the eighteenth dynasty one of the most important records is the autobiography of Aahmes, a general who took a prominent part in the overthrow of the Hyksos and other events, under the first four sovereigns. But from this dynasty the autobiographic inscriptions of the sovereigns become the chief records of this class, those of Thothmes III. and Rameses II. being especially full and valuable. These belong to the same class as the inscriptions of the Chaldean, Assyrian, Babylonian, and Persian rulers, disinterred and deciphered in our own century. They generally are the boastful record of unscrupulous conquest and inhuman cruelties. In Chinese literature there is an autobiography by the famous historian Shiba Sen, who wrote in prison to prove that calamities do not fall exclusively to those who merit them. The *Commentaries* of the Mogul emperor Baber have been translated by Dr. Leyden. The *Autobiography* of Lutfullah, translated by Mr. Eastlake, shows us modern Indian life through the eyes of a Moslem scholar.

In Hebrew literature a large part of the Pentateuch is regarded by conservative critics as autobiographical in its character. A large amount of autobiographic material is found in the writings of the Hebrew prophets, especially in Hosea, Ezekiel, and Jeremiah; and the book of Nehemiah might be called an autobiography. The succession in Jewish literature is kept up by the *Life* of Josephus, which he wrote to vindicate the part he took in the Jewish wars.

The species is wanting in classic literature, but approaches to it are found in the military memoirs of Xenophon and Cæsar, in the forensic compositions of Demosthenes and Cicero, in the *Apologia* of Socrates, and in the poems of Horace. The *Commentaries* of Marcus Aurelius are the picture of a mind, not of a life, but contain glimpses of the latter. The earliest autobiography of general interest is *The Confessions of St. Augustine*, the learned and devout bishop of Hippo in Africa in the fourth century. In this work he writes the story of the frivolity, dissipation, and unbelief of his youth, and his conversion, especially due to the solicitations and prayers of his mother Monica. Its form is peculiar, being an address to God. The book ranks among the great religious classics. The *Confessions* of St. Patrick form an interesting but all too brief account of his youth and his missionary labors in Ireland. The autobiography of Abelard, called *Liber Calamitatum*, tells a story which never will cease to attract by its pathos.

In the Romance literatures autobiographies are less common than in Teutonic. Dante has left a vague but beautiful sketch of his younger life in his *Vita Nuova*, called by Longfellow "a romantic record of his early life and love, written in prose and interspersed with sonnets and *canzoni*." In this the shadowy Beatrice flits across the scene as the beckoning spirit of the poet in the *Divina Commedia*. The interesting *Life of Benvenuto Cellini* (1500–1570), fighter, silversmith, and artist, has been translated into German by Goethe, and into English by Dr. Thomas Nugent in 1771, and again by Thomas Roscoe in 1822. Cardanus wrote a treatise, *De Vita Propriâ*. Alfieri and Goldoni, the great masters of Italian tragedy and comedy respectively, have left us accounts of their lives, as has G. B. Vico, the founder of the science of the philosophy of history. The *Memoirs* of Casanova give a frightful picture of the abounding immorality of the ruling class in Europe before the French Revolution. Silvio Pellico's *My Prisons* is a pathetic chapter of autobiography.

Strictly speaking, there are but few autobiographies in French literature, as the social and public interest generally prevails over the personal in their countless "Memoirs." It is not possible to specify more than the most eminent of these. After the assassination of Henry IV. of France in 1610, his friend and minister, the duc de Sully, published his *Memoirs*, in which, like Cæsar, he used the third person. They present a fine portraiture of the monarch and a history of his reign, so full as it was of important and striking events. Louis de Rouvroy, duc de St. Simon (1675–1755), left for posthumous publication his *Memoirs;* they appeared forty years after his death, and contain descriptions of events and persons during the latter portion of the reign of Louis XIV. and the regency of the duke of Orleans. Others who have written of their own lives and times are the Cardinal de Retz, Mirabeau, Madame Roland, Madame Junot (duchesse d'Abrantès), Madame de Rémusat. Here may be placed the utterances of Napoleon Bonaparte at St. Helena, taken down at his dictation by Las Cases, Gourgaud, Montholon, and his English surgeon O'Meara. Among autobiographies proper come De Thou's (1642) and that of Francis Junius in the same century. Madame Chantal's autobiography and *The Life of Madame Guyon, written by Herself*, take rank among the mystical classics. The celebrated *Confessions* of J. J. Rousseau display a diseased and erratic mind; they are at once famous and pitiable. The sketch Louis Claude de St. Martin has left of his life brings us into the strange company of theosophists and mystics, somewhat like that to which Madame Krudener's introduces us. Chateaubriand's *Mémoires* describe the rise of the devout party in France, while Béranger's *Ma Biographie* and George Sand's show us the literary circles which remained closed to such influences. *Ma Biographie*, by Béranger, is a beautiful story.

In Spanish literature St. Theresa's autobiography, supplemented by her *Letters* and *The Book of the Foundations*, is a great and classic work. That of the historian J. A. Llorente is next in importance.

In German literature autobiography begins with the *Frauendienst* of Ulrich von Lichtenstein, a poem describing his adventures in war and love as a courtly minnesinger. Then comes the *Life* of the mystic Henry Seuse (or Suso) in the fourteenth century. Besides autobiographical poems by Michel Behaim, we have the epic poem *Theuerdanck*, an idealized picture of the emperor Maximilian, which some ascribe to his own pen. In the sixteenth century we have the remarkable autobiography of Götz von Berlichingen, dramatized by Goethe, and that of Thomas and Felix Plater, two Swiss scholars. The close of the century is represented by the autobiographies of Seb. Schaertlin von Burtenbach and of Hans von Schweinichen. The latter contains frank descriptions of the coarseness of contemporary morals. The *Vita* of John Valentine Andrea belongs to the period of the Thirty Years' War, and describes its horrors in Würtemberg. Early in the eighteenth century the chiliast Petersen and his wife published their autobiographies jointly. Edelmann the forerunner of Rationalism, Semler its founder, Bahrdt its caricaturist, Von Reinhard its opponent, Hippel the German Sterne, and the two sufferers for righteousness' sake, C. F. D. Schubart the poet and J. J. Moser the jurist, enriched the literature of the last century in this way. So did the two great Würtemberg theologians Bengel and Œtinger, the pietist Joachim Lange, the polyhistor Morhof, the historian Schlözer, the philologist J. J. Reiske, and the Swiss physician and philosopher J. G. Zimmermann, besides many others. The *Life* of Baron Frederick Trenck, with its account of his escape from an Austrian prison, had a great vogue in its day, and was a popular book in America, but the writer was not trustworthy. The brief sketch by J. G. Hamann, "the magus of the North" and the friend of Kant, covers little more than the story of his conversion. The unfinished *Life* of J. G. Seume (*Mein Leben*) is of especial interest to Americans as describing the methods by which Germans were kidnapped and sent out to fight the Thirteen Colonies. To the transition to our century belong the autobiographies of Goethe, Jung-Stilling, Jean Paul Richter, his friend Arnold Kanne, Kotzebue, Voss, Ignatius Fessler, the historian Johann von Müller, the poet J. G. Scheffner, the philosopher and ex-monk J. B. Schad, the philosopher Krug, the church historian Stäudlin, the Orientalist Bohlen, and Heinrich Zschokke. In our own century Heinrich Steffens and Hoffmann von Fallersleben have published works of this sort too bulky for the general reader. E. M. Arndt, F. Creuzer, Karl Hase, K. Rosecranz, Justus Kerner, Caroline Pichler, Elie Chezy, Fanny Lewald, the artist Schadow, Pestalozzi, Dinter, Von Raumer, Stahr, Gutzkow, Eberty, Bodenstedt, Hackländer, and Wolfgang Menzel have made valuable additions to this class of books. The memoirs of Varnhagen von Ense, Von Gagern, and Prince Metternich fall rather outside its lines, as do the untrustworthy memoirs of Von Schön. The autobiographies of Canon Schmid, Martin Boos, Klaus Harms, F. A. Krummacher, Dr. Harless, and G. H. von Schubert, and many others are of theological interest mainly.

In Scandinavian literature the best-known autobiographies are those of the poets Holberg, Œhlenschlager, and Hans Christian Andersen.

It is believed that the earliest in English is that of Thomas Tusser, the writer on husbandry (1573). Next comes *The Autobiography and Diary* of James Melville (ob. 1613), the less illustrious nephew of Andrew Melville. That of Lord Herbert of Cherbury (1581–1648) presents him as a fiery but vain and boastful person, whose actions do not come up to his manifesto. This work was printed by Horace Walpole more than a century later (1764) at his private press, which formed one of the curiosities of Strawberry Hill. Among interesting English autobiographies are those of Lord Clarendon, "full of a thousand curious anecdotes," and of Bishop Gilbert Burnet, called *History of His Own Times*, etc., which was printed, with a preliminary biography, by his son Thomas. His works have been vindicated by Lord Macaulay from the sneers of the wits of the succeeding reign. The *Memoirs of my Life and Writings*, by Edward Gibbon, coming down to 1788, constitute a most interesting appendix to his great *History*, as describing the motives and the circumstances of its composition, and the training for the work he had received. Those of John Dunton, Richard Cumberland, Colley Cibber, William Hutton, and James Lackington take rank in our secondary literature because of the side-lights they cast on English life in the last century. In Holcroft's autobiography we have a valuable account of the republican literary set in England during the French Revolution. The similar work by William Gifford is of less interest, but exhibits the power of perseverance. De Quincey's *Confessions* and *Autobiographic Sketches* are masterpieces in this kind of writing. Coleridge's *Biographia Literaria* is much more criticism than biography, but what there is of the latter excites our regret that neither he nor any of his disciples have told fully the sad story of his life. Much of Charles Lamb's writing is autobiography, touched with humor so kindly as to make every reader his sympathetic friend. The autobiographic elements in George Borrow's *Lavengro* and the *Romany Rye* hardly can be separated from the admixture of mystification. Mr. John Stuart Mill's *Autobiography* and Mr. Carlyle's *Reminiscences* are the most remarkable additions to this species of literature in our own times. Leigh Hunt's *Autobiography* has been praised by Carlyle more highly than it seems to deserve. Those of Charles Knight and Robert Chambers show how men who had found the acquisition of knowledge difficult for themselves labored to bring it within the reach of their countrymen. Crabbe Robinson and Miss Caroline Fox introduce us to the best company, and thus make up for any want of interest in themselves. The present sovereign of England and her chief constitutional adviser both have ventured into this field.

Our religious literature is not so rich in works of autobiography as might be expected. John Bunyan's *Grace Abounding* is one of the most notable books of this class, being hardly inferior in interest to his great allegory. The *Life of Fraser of Brae* in that century, and the autobiography of John Newton in the next, and John Wesley's *Journal*, are favorable specimens of this kind of writing; and Coleridge pronounced Richard Baxter's the best church history of England during the Commonwealth and Restoration periods. The *Autobiography* of Symon Patrick and the *Diary* of John Worthington introduce us to the group of Cambridge Platonists in the sixteenth century. That of Thomas Elwood, the Quaker, gives us the most authentic glimpse of Milton in his last years of life. The literature of the Society of Friends is richer in this department than that of any other Protestant sect, the most remarkable works being George Fox's and Thomas Story's journals and Dr. John Rutty's *Spiritual Diary*, the last being one of the most notable specimens of introspective literature in existence. Whiston's *Memoirs* is the painful portrait of an honest but ill-balanced intellect. John Byrom's *Remains* show us William Law and his mystical school. In our own century the two extremes of religious thought are presented in Dr. Newman's *Apologia pro Vita Sua*, a defence of his motives in leaving the English for the Roman Catholic Church, and in his brother, Francis W. Newman's *Phases of Faith*, with which may be classed Blanco White's *Memoirs*.

In American literature the first place is held by Franklin's *Autobiography*, which, though frequently published in English and the continental languages, was first given to the world in its original shape by Mr. John Bigelow in 1868. It is written in a frank, almost cynical spirit, with no attempt to conceal the author's mistakes and weaknesses. It has had the fortune to be much more read in Europe than at home. The *Memoirs* of Joseph Priestley belong, like their author, partly to America. Alexander Graydon's *Memoirs* contain graphic sketches of old Philadelphia and its society. Buckingham's *Reminiscences* are a striking picture of struggle and success in the youth of an American editor. The *Life* of Black Hawk and the *Narrative* of Frederick Douglas are alike painful pictures of what men of other complexions have suffered at the white man's hand. With the latter we may associate the *Mémoires* of Toussaint L'Ouverture, as showing of what the black man is capable in two very distinct fields. The *Autobiography* of John B. Gough is valuable chiefly for its picture of victorious struggle with an enslaving habit. That of Zerah Colburn satisfies our curiosity in regard to this mathematical prodigy. *The Life of Stephen Burroughs* is a curious performance by a criminal who went through many vicissitudes in the early years of the Republic. The memoirs of the artist Trumbull and of Samuel Breck contain many curious glimpses of American life and manners, while *The Memoirs of an American Lady*, by Mrs. GRANT of Laggan (*q. v.*), furnishes a graphic picture of life in old Albany. Mrs. Fanny Kemble Butler is another British lady who might be claimed as naturalized in our literature, as her *Journal of a Residence on a Georgia Plantation* and about half of her *Recollections of Later Life* belong to us. The *Autobiography of an Actress*, by Mrs. Mowatt (now Mrs. Brewster), also comes from a profession which has produced many books of this class. Horace Greeley's *Recollections of a Busy Life* has some claims to rank beside Franklin's work.

Religious autobiography in America begins properly with Thomas Story, the Quaker. The next notable book of this class is John Woolman's *Journal*, praised by Charles Lamb and edited by Mr. Whittier. The *Life* of John Murray, the founder of the Universalist denomination, is interesting, in spite of the author's indifferent style, because of its glimpses into American situations just before and after the Revolution. Those of Ashbel Green, Lyman Beecher, Fairchild, and C. G. Finney cast light on church history in America.

Among the numerous autobiographic records of the Civil War in the United States the *Memoirs* of Gen. W. T. Sherman and the *Narrative* of Gen. Joseph E. Johnston are of especial value.

"Read biographies," says Thomas Carlyle, "but especially autobiographies."

AUTONOMY. Autonomy is the right of a nation or state to make its own laws. The right is not only assumed by independent governments as an attribute of sovereignty, but is also accorded to dependent states or provinces, in a limited degree, by the superior power.

But there are certain limitations upon the right of even independent nations to regulate their internal affairs, analogous to the restrictions upon the rights of individuals and corporations. The first principle of self-defence allows the nations in general to prevent the establishment in one nation of a government professedly hostile to the other nations; but this ground of interference in the domestic affairs of nations is liable to abuse, although it has been sometimes asserted. Other pretexts for intervention in the domestic concerns of independent nations are—(1) To compel performance of a guarantee; (2) to protect treaty and other conventional rights; and (3) to settle internal dissensions amounting to active hostilities, and which the parties are unable to compose among themselves. The latter ground of interference is the prevention of the continuance of bloodshed in the interest of humanity; but this, in the opinion of the best jurists, ought not to be put forward as an excuse for intervention in the internal affairs of a nation unless supported by the invitation of the parties to the civil war. The intervention of the principal European powers in the domestic affairs of Turkey and Egypt is a limitation upon the autonomy of the Ottoman empire, and is justified by the principles of interference above indicated. (See INTERVENTION.)

AVATĀR, or AVATĀRA, a term in the Purānic or later Hindoo mythology signifying "descent," and applied to incarnations of the Deity, especially Vishnu. The curious subtilty that characterizes the philosophy of the Brahmans makes these Avatārs of five degrees: in the first or highest the full essence of the deity becomes incarnate; in the lower degrees, only a half, a quarter, or an eighth part of the divine essence; while in the lowest there is merely an infusion of the divine qualities into men, animals, or even inanimate objects. In popular belief, Vishnu, the Preserver, is the only member of the Trimūrti, or Hindoo Triad, that has infused his essence into actual flesh and blood for the salvation of the world in times of peril. The Avatārs of Brahma and Siva mentioned in older works are explained as manifestations of those deities. The system of the Avatārs seems to have originated in efforts of the Brahmans to counteract the success of Buddhist propagandists in withdrawing the people of India from their ancient religion. They began by making the renowned heroes of the great epic poems human manifestations of Vishnu, and afterwards added to the number, until now there are usually reckoned ten prominent Avatārs, though some Purānas give many more. The ten most noted are named as follows: (1) Matsya, the Fish, in which form it is said that Vishnu, during a universal deluge, preserved Manu, the ancestor of the present race of men, by drawing his ark to a high mountain. (2) Kūrma, the Tortoise, in which form he descended to assist in recovering the moon, the drink of immortality, and other precious things which had been lost during the deluge. He supported the mountain Mandara while the deities and demons used it as a churning-stick in churning the ocean of milk to regain the valuables. (3) Varāha, the Boar, in which form (or rather half-man, half-boar) Vishnu, after a contest of a thousand years, slew the demon Hiranyāksha, the chief of the Asuras, who had plunged the earth in the depths of the sea. (4) Nrisingha, the Man-Lion, in which form he slew Hiranyākasihu, the brother of the former demon, who had obtained from Brahma the boon that he should not be slain by either god, man, or animal, and had become so powerful that he usurped the dominion of the three worlds and appropriated to himself all the sacrifices intended for the gods. (5) Vāmana, the Dwarf, in which form he deceived and overcame the demon Bali, depriving him also of usurped dominion over the worlds, but left to him the lower world, Pātāla. (6) Parasu-rāma, or Rāma with the Axe, in which, being born as a Brahman, he saved that caste from the domination of the military caste, the Kshatriyas. (7) Rāma-chandra, the Mild or Moon-like Rāma, who destroyed Rāvana, the Daitya sovereign of Ceylon, and other demons. The celebrated Sanscrit epic poem, *Rāmāyana* ("The Goings of Rāma"), attributed to Vālmīki, is popularly interpreted as recounting the exploits of Vishnu. (8) Krishna, the Dark One, in which Vishnu became completely incarnate, and is therefore the greatest of the Avatārs. The anniversary of his birth, coming about August 1, is observed as a great festival called Janmāshtamī. The great epic *Mahābhārata* relates how Krishna assisted the family of the Pāndavas in their war against the Kurus, but it is manifest from various parts of the poem that Krishna did not at the time of its composition occupy so high a place in mythology as was afterwards assigned to him. (9) Buddha is called by some Hindoos an incarnation, by which Vishnu induced the Daityas, demons and wicked men, to abandon the sacred ordinances of the Vedas, violate the laws of caste, and thus bring upon themselves sure destruction. The nine Avatārs mentioned thus far belong to the past; the four first occurred in the Satya, or first age of the world; the three next occurred in the Tretā, or second age; Krishna came at the end of the Dvaspara, or third age. (10) At the end of the fourth, or present age, when the world has become wholly corrupt, Vishnu will appear as Kalki, to destroy wickedness, restore righteousness, and renew all creation. The popular expectation is that he will come from the West as a conqueror on a white horse.

For a fuller account of the Avatâras see *Hindu Mythology, Vedic and Purânic*, by W. J. Wilkins (London, 1882); *The Classical Dictionary of Hindu Mythology*, by G. Dowson (London, 1879); *Vishnu-Purāna*, translated by H. H. Wilson (London, 1868); and Muir's *Original Sanscrit Texts*.

AVE MARIA. This is the name of one of the most popular Catholic prayers. It is the "Hail Mary" in English, and is sometimes also called the "Angelic Salutation," as in a bequest of Sir William de Clinton, A. D. 1336, to the priory of Maxstock, which he founded. It is composed of four parts in its final development: (1) The words of the archangel Gabriel to the Virgin, with the slight addition of her name, "Hail, full of grace, the Lord is with thee" (Luke i. 28); (2) the words of her cousin Elizabeth, "Blessed art thou among women, and blessed is the fruit of thy womb" (Luke i. 42), with the addition of the holy name of Jesus; (3) the unanimous acclaim of the Fathers of the Council of Ephesus after condemning the heresy of Nestorius, who denied the divine maternity, "Holy Mary, mother of God, pray for us sinners" (Baronius, *ad An.* 431); (4) the concluding part, made by some unknown Franciscan friar in the fifteenth century, "Now and at the hour of our death. Amen." It will thus be seen that this prayer, which now enters so largely into Catholic devotions, is a spiritual mosaic which it took a thousand years to complete. The first time the scriptural part of the Ave Maria was employed by the Church in her public service was at the end of the sixth century, when St. Gregory the Great introduced it as the offertory of the fourth Sunday in Advent, where it is still found in the Roman Missal. In the year 1237 we light on the earliest formal mention of the Hail Mary as a private prayer in English, in an instruction to the people by Alexander de Stavenly, bishop of Coventry, in which they are directed to recite it seven times every day; and the folio edition of the Sarum Breviary, printed at Paris in 1531, gives the Ave Maria exactly as it is now said. (Rock, *Church of Our Fathers*, vol. iii. part i. p. 319.) (R. S.)

AVERAGE, GENERAL. The principle of general average being, all the world over, that a sacrifice voluntarily made or expense incurred for the common benefit of all the interests in a sea-adventure should be paid for by a common contribution, it is only necessary to supplement the admirable article in the *Encyclopædia* by pointing out the difference between the application of that principle in England and in the United States.

See Vol. III. p. 127 Am. ed. (p. 145 Edin. ed.).

The English practice insists upon the voluntary feature and common danger. It is said to be no sacrifice to cut down a mast about to be blown out or to strand a vessel about to go ashore, because the loss is already inevitable; that the wages and provisions of the crew in a port of refuge, being an expense the ship-owners are bound by the contract of carriage to meet, cannot be said to be incurred for the common benefit; that warehousing the cargo in a port of refuge, all the interests being then in safety, is an expense incurred for the especial benefit of the cargo, and therefore chargeable to it; and that the expense of reloading should be charged to freight, because it is a necessary condition of its being earned.

On the other hand, in the United States the various interests in the adventure are treated as partners until it is terminated, and the duty of contribution is recognized as having nothing to do with contract, but as a principle of pure equity arising out of extraordinary and uncontemplated events. If, therefore, there is the least exercise of human will and the motive is the common benefit, a sacrifice so made, and all the expenses necessarily incurred as the result of it, are held entitled to contribution in general average. In a word, the English practice is distinguished by its consistency with logic, and the American by its consistency with the equitable character of the doctrine itself. There can be very little doubt that the American practice will in the end prevail.

The objection that there can be no voluntary sacrifice when the vessel is sure to be sunk or go ashore is not entitled to much weight, because the certainty of common destruction is the condition of every general-average act, and is the only possible justification to the master for committing it. The material inquiry is as to the motive. If the master, although the vessel is certain to be sunk or go ashore, chooses the place where and the time when she shall be stranded, he makes a voluntary sacrifice for the common benefit. The fact that the stranded vessel subsequently becomes a total loss will not relieve cargo saved from the duty of contributing. Arnould and Lowndes and some of the best English authorities approve the American law about voluntary stranding, although the question has never been passed upon by the English courts; but the International Congress which met at Antwerp in September, 1877, and adopted the principles known as the York-Antwerp rules, excluded it from contribution in general average. So the American practice of bringing into general-average contribution the wages and expenses of the crew while seeking and staying at a port of refuge, the expense of unloading, warehousing, insuring, and reloading the cargo, is more equitable than the English of treating them as particular average. If seeking a port of refuge is a general-average act at all, the expenses necessarily incurred thereby should be brought into contribution too. Of course, if the necessity of seeking the port is the result of unseaworthiness of the vessel or barratry of the master and crew, or if the necessity of discharging the cargo is the result of *vice propre*, or if the voyage is finally broken up at the port of refuge, these expenses would be specially charged to each interest for which they were incurred. The Queen's Bench division in the late case of Attwood *vs.* Teller held, in variance with the settled practice of English adjusters, that these expenses are entitled to contribution when the port of refuge is sought because of a voluntary sacrifice or act itself entitled to contribution, but intimated that this would not be the case if sea-peril were the cause. The York-Antwerp rules substantially express the American practice.

It is usual in the United States, if a master who seeks a port of refuge to repair damage caused by sea-peril chargeable to the ship makes temporary repairs of no permanent benefit, so as to enable him to proceed promptly on his voyage and save the delay and expense of discharging cargo, to allow these temporary repairs to come into general-average contribution. And a master who cuts away ship's material in a state of wreck which might by any possibility be saved is held in the United States to have committed a general-average act, although it would not be entitled to contribution by the English practice or by the York-Antwerp rules, on the ground that the material was practically lost already, and the master, because of the positive danger it put the other interests into, had no alternative.

In the United States the lien for contribution is reciprocal, the cargo-owners having the same right to enforce it against the vessel as the master has against the cargo. It makes no difference in the adjustment that the vessel, freight, and cargo all belong to the same person, or that there is but one interest at peril, as in case of a vessel in ballast; but such adjustments only occur when contribution is sought from underwriters. The contributory value of the freight is ascertained throughout the United States by deducting from it an arbitrary sum, from one-third to one-half, to represent the expense of earning it. An interesting compilation of the laws and customs of all maritime nations upon this subject has been published by John H. Gourlie, Jr. (H. G. W.)

AVOCET (Ital. *avocetta*), a very long-legged but web-footed wading-bird of the genus *Recurvirostra*, family *Recurvirostridæ*; spelled also Avoset and Avosit. The species are very few: *R. avocetta* is that of Europe, from which *R. Americana* is distinct. The plumage is white, varied with black on the back and wings, the head and neck chestnut or ashy; the bill black, the feet blue. The singularity of these birds is not only in the extreme slenderness, acuteness, and *upward* curve of the bill, but in the combination of certain characters of both wading and swimming birds. Thus, the legs are long, as usual in the former, yet the toes are full webbed, the body flattened underneath, and the under plumage thick and curly to resist water, like a duck's. The birds consequently wade up to their bellies in shallow pools in search of the minute aquatic animals for which they explore the mud with their curious bills, but on occasion swim with ease. The American avocet is abundant in the waters of the Western United States, especially in the alkaline regions of the interior, but is rare in the Eastern, Middle, and Southern States. It goes in small flocks, which present a striking appearance when wading or swimming; it is unsuspicious, and permits itself to be approached without showing alarm, though when its retreats are invaded the whole flock vociferate their displeasure with the most vehement and reiterated outcries. The nest is simply built of grasses and weeds in a secluded spot on the ground near the water's edge; the eggs are three or four in number, dark-colored, and heavily blotched, about two inches long by one and a third broad. (E. C.)

AVONDALE, an incorporated village of Hamilton co., Ohio, is a beautiful suburb of Cincinnati, with which it is connected by horse-car railroad, by the narrow-gauge Northern Railroad, and by the Avondale and Spring Grove Railroad. It is lighted with gas, has five churches, a graded public school, and contains the Cincinnati Zoological Garden, enclosing 60 acres and well supplied with specimens of the animal and vegetable kingdoms. Population, 2552.

AVOWRY, in law, the plea or answer of the defendant in an action of replevin brought to recover property distrained, whereby defendant admits the fact of the distress, but sets forth a right on his part to levy the same for rent, services, tolls, or the like in arrear. An avowry is substantially a declaration constituting the avowant plaintiff in the action. The plaintiff, upon filing of an avowry, becomes substantially defendant in the cause, and enters pleas to the avowry or demurs thereto as he sees fit.

Where an issue is raised under pleas to an avowry the question submitted to the jury is the right of the avowant to levy the distress complained of. By virtue of the provisions of stat. 17 Chas. II. c. 7, which are in force in most of the United States, where a verdict is rendered in favor of the avowant judgment may be entered in his favor against the plaintiff for the amount of rent due for which the distress complained of by plaintiff has been levied, and thereupon execution may issue as in the case of an ordinary judgment. (L. L., JR.)

AYE-AYE, a quadruped of the order *Primates*, suborder *Prosimiæ*, super-family *Daubentonioidea*, and family *Daubentoniidæ*; the *Daubentonia Madagascariensis*. The super-family is distinguished from *Lemuroidea* by the possession of only two kinds of teeth instead of three, the canines being early deciduous; incisors rodent-like, growing from persistent open pulps; no pectoral mammæ. The family is distinguished from *Lemuridæ* and *Tarsiidæ* by the peculiar conformation of the fore paw.

With the exception perhaps of *Hyrax*, no living mammal offers so singular a combination of characters as the aye-aye, a wide range of affinities being indicated by the generalized or synthetic type of this primitive animal. The sum of its organization, however, is unmistakably lemurine, and it may be tersely characterized as a lemur with rodent dentition. The sole surviving representative of this unique type is the *Daubentonia Madagascariensis* of Geoffroy, named *Chiromys* by Cuvier and *Aye-aye* by Lacépède. It is a small squirrel-like creature, as far as its long bushy tail may warrant such comparison, with large thin ears opening forward, and altogether peculiar physiognomy. It is remarkable for the attenuation of the middle finger of the hand, which seems as if withered; the fourth digit is longest; the thumb, though directed away from the other digits, is not opposable, like the inner digit of the foot. The animal is arboreal and nocturnal, and in geographical distribution is confined to Madagascar; of its economy we still lack full particulars. Until quite recently the only specimens known were two in the Paris Museum.

The dentition caused the aye-aye to be long referred to the *Rodentia*. In the adult there are but two kinds of teeth, the canines being early deciduous. The incisors are a single pair in each jaw, thoroughly rodent-like in structure as well as in appearance. They are large, prominent, proclivous, mutually apposed, becoming scalpriform by mutual attrition; they grow persistently from open pulps, and are curved in the arc of a circle. The under incisors traverse the jaw nearly in a semicircle, their roots reaching back as far as the base of the coronoid process, about three-fourths of the whole length being thus socketed. Canines being absent, there is a wide diastema between the incisors and the molars. The premolars and molars together are four in number on each side above and below, of simple structure, having severally one, two, or three roots. The formula of the adult is given by Huxley as *i.* $\frac{1-1}{1-1}$, *c.* $\frac{0-0}{0-0}$, *pm. m.* $\frac{4-4}{4-4} = \frac{10}{10} = 20$; by Owen the grinders are noted as *pm.* $\frac{1-1}{0-0}$, *m.* $\frac{3-3}{3-3}$. Huxley's formula for the milk dentition is *di.* $\frac{2-2}{1-1}$, *dc.* $\frac{1-1}{0-0}$, *dm.* $\frac{1-1}{1-1} = \frac{8}{4} = 12$. Owen says that the second upper incisor and canine and the lower milk molar, all very minute, are not replaced; the first true or permanent molar follows so speedily the deciduous one that, being in place therewith, it has been reckoned with the milk dentition. Paul Gervais's figure clearly shows *pm. m.* $\frac{4-4}{3-3}$, so that his formula is apparently resolvable into Owen's. Gervais's figure of the *young* aye-aye is taken from an individual which had lost the milk incisors, but retained the lower milk molar. The general appearance of the adult dentition is strongly *sciurine*, not only in the relation of the minute upper premolar to the large true molars, but also, to some extent, in the shape of the teeth themselves.

Conformably with such dentition, the lower jaw and its articulation are modified as in rodents; the jaw is short and deep, with a low condyle, the long axis of which is longitudinal, the glenoid fossa being correspondingly modified to permit the forward-backward movement of the jaw required for the apposition of the incisors. The sessile condyle, however, is the reverse of the usual rodent condition. The skull, as a whole, is globose, with expansive cranial and shortened facial portions, showing its high grade in the relative proportions of these parts, which are quite unrodent-like. The transverse convexity of the cranium is still stronger than the longitudinal. The bony orbit is completely circumscribed, but nevertheless opens freely into the temporal fossa. The forward and upward and but little outward presentation of the orbits is quite different from their lateral aspect in rodents.

Superficially, though not in essential characters, the configuration of the skeleton recalls that of a sloth. There are thirteen dorsal, six lumbar, two or three sacral, and twenty-two or twenty-three caudal vertebræ. The humerus has a strong supinator ridge and an entocondyloid foramen. The phalanges both of hand and foot are greatly lengthened, and the middle digit of the hand is singularly attenuate; the terminal phalanges are all curved, compressed, and pointed. The thumb is scarcely opposable, unlike the inner digit of the foot, which has the usual flat nail of *Primates;* all the other digits, both of hand and foot, having compressed claws. There are ten carpal bones, including an os intermedium and a supplementary sesamoid. The tibia and fibula are free, like the ulna and radius; the tarsal bones are seven, as usual. The whole structure of the limbs, excepting that of the curious middle finger, conforms with a lemurine type. The digestive system shows the same affinities. The scrotum is sessile; the penis pendent; the testes not retractile, though the tunica vaginalis communicates with the general peritoneal cavity. There is a prostate and a pair of Cowper's, but no vesicular, glands. There is but one pair of teats, which are inguinal, not pectoral, the nipples being situated near the vulva (Owen, *Com. Anat. Vert.*).

The external characters of the aye-aye fully bear out the lemurine affinity which the anatomical structure, saving only the dentition, affords. The eyes look forward, not sideways; the ears open anteriorly, not laterally; the nostrils are median, anterior; the upper lip is not cleft. There are but two nipples, indicating few young, while rodents are noted for their fecundity. Finally, the construction of the hands and feet are thoroughly "quadrumanous," and even lemurine, to the degree that a certain one of the digits has a different character from all the rest. The hind paw is substantially as in any lemur, while the anomalous middle digit of the hand may be compared with the no less singular though different condition of the index finger in the potto and angwatibo.

It appears that Cuvier's term *Chiromys*, bestowed in 1800, should give way to *Daubentonia*, as proposed in 1798 by Etienne Geoffroy, Cuvier's excuse for setting the latter aside being indefensible; besides, Cuvier's name is inappropriate, as indicating a rodent. In 1802 or 1803, Lacépède called the genus by the barbarous and meaningless term *aye-aye*, said to be merely the exclamation of the surprise which the natives made when Sonnerat showed them his original specimens. The long discussion which the *Sciurus Madagascariensis* of Gmelin has occasioned on the part of many famous zoologists forms an interesting chapter in the history of mammalogy. (E. C.)

AYMARAS, a race of semi-civilized South American Indians who, with the closely-related Quichuas, formed the principal population of the ancient Peruvian empire. They resemble the Quichuas in physical appearance and somewhat in language, but Squier believes them to be of a distinct race. Their civilization is as ancient as that of the Quichuas or Inca people, perhaps in some respects more so, and they were one of the early conquests of the advancing Inca empire. They inhabited the fertile and temperate valleys of the Andes which now form contiguous districts of Peru and Bolivia, where, though much reduced in numbers, they are still found—in the provinces of La Paz and Oruro in Bolivia, and sparsely in the Peruvian province of Puno. This region surrounds Lake Titicaca, which they claim as the ancient centre of their religion and government. Their traditions speak of an older people. the Collaguas, from whom they descended, and who migrated from the north at some remote epoch and made the sacred isle of this mountain-lake the heart of their kingdom. In this respect their traditions are distantly related to those of the Incas. Their civilization resembled that of the Incas, and may have been partly derived from it, while they were probably the originators of many of the Inca rites and customs. They were active and skilful in architecture, had many important mechanical arts, and were remarkably expert in the working of silver and gold. They were highly proficient in architecture, and built splendid edifices richly adorned with sculpture and painting. Many monuments of their architecture yet remain, principally tombs, of which there are numerous examples. One form of tombs, called *chulpas*, seems peculiar to the Aymaras, and consists of round or square towers, of stone or sun-dried bricks, from ten to forty feet in height, and containing one or more stories, each story holding a body, with pottery and other articles. Their entrances always face east. These edifices are joined together in groups of from twenty to one hundred, and when situated on an eminence give the impression of a populous village. Other tombs are large, square buildings with a single opening, and containing twelve bodies, clothed and seated feet to feet around the centre of the enclosure. The dead were usually sewn in skins of the llama, and from the action of the dry mountain-air soon became like mummies. The chiefs and principal people had the custom of placing their dead in the main room of their houses, surrounded with vases, clothing, jewels, and other personal effects of the deceased. Other remains of Aymara architecture consist of peculiar hill-forts, formed by a series of concentric terraces and stone walls which surround a conical eminence of very regular form.

The Aymaras worshipped the sun as their principal deity. They believed that this orb periodically disappeared, and that, after a long interval of darkness, it again emerged from the sacred isle of Lake Titicaca. The present sun represents the fifth reappearance. Their religion was of a spiritual cast, and gave rise to a complex priesthood, whose members were vowed to celibacy. One strange custom of the people was the habit of compressing the skulls of infants until they assumed a conical shape.

The Aymaras at present number probably about 200,000. They are of small stature, have regular and strongly-marked features, and an olive-brown complexion. Their hair is black and straight. They are marked by a thoughtful and melancholy expression, and seem morose and apathetic in disposition, possibly a result of centuries of harsh and inhuman treatment from their conquerors. Their chief occupation is agriculture. In religion they are zealous Catholics, though they mingle certain heathen observances with the Christian rites. The Aymara women carry their children, who are silent and uncomplaining, slung in a shawl over their shoulders. They all wear an extraordinary hat, which has much the shape of a coffin, adorned with red cloth and tinsel and draped with black hangings.

The memory of their ancient empire is still vivid in the minds of these people, and they cherish hopes of future independence. In 1780, in common with the other Peruvian Indians, they rose in a fierce revolt, massacred thousands of the Spaniards, and were only quelled by the betrayal, capture, and execution of their leaders. During the long war of the provinces for independence the Indians took part against both parties, and gave the whites much trouble. Since the establishment of independent republics they have been less oppressed, and have made considerable progress. (C. M.)

AZALEA, a genus of Ericaceous shrubs of many species, the greater part being Asiatic. *A. arborescens*, *A. viscosa*, *A. nudiflora*, *A. calendulacea*, and *A. Vaseyi* are found on the Atlantic slope of the North American continent, while on the Pacific coast, from California far northward, grows *A. occidentalis*, a species midway between *A. calendulacea* and *A. viscosa* of the East. The most widely distributed of these are *A. nudiflora* and *A. viscosa*, which range from Canada to the Gulf of Mexico, growing usually in low, damp places or on hills or mountains where the soil is rather damp or the situation cool. *A. calendulacea* and *A. arborescens* seem confined to the Alleghanies from Pennsylvania to Georgia, and *A. Vaseyi* has been found only in a few locations bordering Georgia and North Carolina. The Pontic azalea (*A. Pontica*) grows in the south of Europe and in Asia, and has been supposed to be the plant from which the bees made the poison honey spoken of by Xenophon. *A. nudiflora* and *A. viscosa* are known in the Eastern United States as wood honeysuckle and swamp honeysuckle, respectively. The Germans call the Pontic azalea *Pfingstenblume*—Whitsun-flower; and some persons in America apply the name "Pinxter-flower" to the wood honeysuckle. *A. calendulacea* and *A. arborescens* often grow ten feet high, but the other American species are dwarf.

Azalea is closely allied to rhododendron, a famous evergreen, and some botanists, failing to find any definite line, class them all as rhododendrons. But azaleas are deciduous, having generally fewer stamens than in rhododendron, more tubular and less regularly-formed flowers, and proportionately longer stamens and pistils.

In common with many other Ericaceous plants, popular impression charges some of the species with killing sheep which feed on them in winter or early spring; and it seems settled that sheep occasionally die after eating greedily of them when other food is scarce. The rhododendron of the Romans appears to have been the oleander, which is undoubtedly poisonous. In districts in America where both the rhododendron and azalea abound, and honey is abundantly collected, no suspicion of any poisonous property has ever arisen. All the species, both of rhododendron and azalea, freely hybridize, and varieties from hybridization between these genera and species, as well as from the intercrossing of varieties, are very numerous, and constitute some of the most highly-prized ornaments of gardens. They thrive very well in cool, open soils and in situations protected from cold winds; provided, the horticulturists say, there is but little lime in the earth where they are planted. The hybrid azaleas are also highly prized as winter-bloomers in green-house culture. (T. M.)

AZAZEL (עֲזָאזֵל) is a Hebrew word of uncertain derivation, used in the Bible only in the ordinance of the day of atonement (Lev. xvi. 8, 10, 26). In the English Authorized Version it is translated "scape-goat," but is also given in the margin at verse 8 as a proper name. The Septuagint translates it by τῷ Ἀποπομπαίῳ in verse 8, but by *εἰς τὴν ἀποπομπήν* in verse 10, and by a similar phrase in verse 26. The Latin Vulgate translates it "*hircus emissarius.*" Other ancient versions retain the word unchanged. Commentators from the earliest times have been divided as to its meaning: some, as Luther, following the Vulgate, have considered it a name given to the goat that was sent into the wilderness, an interpretation which does violence to the original; others consider it the name of a place to which the goat was sent; others, including some eminent scholars of recent times, interpret it "complete removal or remission;" but the great majority of modern commentators, as well as Origen and others of the Fathers, regard Azazel as an evil spirit. According to them, the Hebrew ritual required two goats, as nearly alike as possible, to be presented before Jehovah; the high priest then cast lots, and one was chosen for Jehovah, the other for Azazel. The former was offered in sacrifice; the latter was immediately led away into the wilderness and set free. What was the significance of this act is not clear, but it must be remembered that demon-worship was expressly condemned by the Mosaic law (Lev. xvii. 7 and elsewhere). The apocryphal Book of Enoch, probably written in the second century, uses the name Azazel several times to denote the chief of the spirits by whom the earth was corrupted. From the Jews and the Christians the word passed over to the Arabians, and in later magical treatises Azazel and Azaël are genii that preside over the elements.

See Vol. III. p. 149 Am. ed. (p. 172 Edin. ed.).

AZTECS, the name of the predominant tribe in a powerful Indian confederacy which at the period of the Spanish conquest controlled the inhabitants of the Valley of Mexico and of a large exterior territory. In the political, social, and religious organization of this people is displayed a striking and peculiar phase of human civilization, without parallel elsewhere and of the highest interest in several of its features. After reviewing their political and social condition, their industries, architecture, religion, and history as far as known, we shall consider their proper place in human progress, though the extant evidence is too scanty for a full decision of this disputed question.

Political Organization.—The early Spanish writers beheld in the Aztec government a feudal despotism somewhat similar to those existing at that period in Europe, and drew numerous parallels which had no foundation outside their fancies. Unfortunately, the conquerors so completely destroyed the records and institutions of the country that but little evidence now remains of the true character of the government. The recent researches of Lewis H. Morgan in *Ancient Society* throw new light upon the subject, and aid in the solution of a partly-sealed question, though probably in some respects, and perhaps in all, the Aztecs had attained a higher civilization than that for which he gives them credit.

The Aztec confederacy comprised three tribes, the Aztecs, the Tezcucans, and the Tlacopans, the former situated on some made land in the Lake of Mexico, and the others on its borders. Their defensive situation, and perhaps a greater boldness of disposition, gave the Aztecs the supremacy in the confederation and the leadership in its many successful wars. Each of these tribes had its own ruler, called *king* and *emperor* by the Spanish writers, but to whom the title *war-chief* would perhaps be more applicable, since the so-called monarchy was most probably but an unfoldment of the principle of chieftainship existing in the northern American tribes. In all history the ruler seems to obtain his position either through personal valor without election, or through election by minor chiefs or by the body of freemen; then the field of choice, at first general, becomes confined to the members of a gens or of a single family; finally, the office becomes strictly hereditary and the elective principle sinks into decadence. The Aztecs had attained the second phase in this process of development. The so-called nobles—probably chiefs of subordinate districts or tribes—elected the monarch, their choice being confined to some member of the family of the Montezumas, and being usually governed by the valor of the selected candidate. The rulers thus chosen had undoubtedly great authority, though the people had not fully given up their pristine liberty into the hands of a despot. Probably the main duty of the ruler at first was to lead the people in war, but the exigencies of a growing social organization, with the legislative and judicial duties thence arising, and the gradual seizure of civil authority by the monarch, must eventually have hindered any active personal participation in military enterprises. At the date of the Spanish conquest other duties than those of war were becoming prominent, and the last Montezuma was a member of the priesthood.

As to the minor organization of the people, it was probably greatly misunderstood by the Spanish historians. They speak of some thirty great *caciques*, or nobles with large landed estates, who owed feudal duty to the king, but were supreme at home. Yet there are good reasons for the belief that there was no personal ownership in land, and that it was the common property of the people. The supremacy of these caciques was more probably in military matters, though their civil authority was rapidly increasing. Their offices were possibly elective, like those of the Indian sachems of the North. In like manner, the ruler, or head-chief, was elected by a council of the minor chiefs. The historians speak of this ruler as despotic, but they also tell us he could do nothing without the sanction of the council of chiefs. His supremacy was perhaps military only, and civil affairs, as a rule, lay in the hands of this council. The judicial authority was given to supreme judges, who were appointed by the ruler, but were independent of him in their office. Their positions were held for life, and their decisions were without appeal. Below these judges were minor courts, and inferior magistrates elected by the people, who also elected subordinate officers, each to watch over the conduct of a certain number of families. The true character of this arrangement was probably misunderstood by the early historians, and the organization was perhaps analogous to that of the *gens* and *curia* of the early Romans. The council of chiefs was supplemented in Tezcuco by periodical meetings of the judges, great and small, at the capital, to determine important suits and aid the monarch in the transaction of public business. The laws of the Aztecs were severe. There were many capital offences, and even intemperance was punished in the young with death, and in the old with loss of rank and property. Slavery seems to have been common, but the slaves were not ill-treated, and the poor often resigned themselves or sold their children to slavery. But no one could be born to servitude; the children of slaves were free.

The system of revenue yields indications of its origin in the village-community system. Taxes were paid in kind, and each principal city with its contiguous villages and territory composed a district, which derived its support from the produce of the land. Probably an extension of this arrangement caused an allotted portion of the produce of the whole territory to be paid to the principal city. In addition to this, the manufacturing interests also paid their stipulated tax. There may have been at first a voluntary contribution or a free exchange between agriculturists and manufacturers, but in the later days of the kingdom the taxes were exacted with great rigor, defaulters being liable to be sold into slavery. But a considerable portion of the revenue of the state came from another source. Wars were conducted for two objects—to take prisoners and to gain tributary subjects. The sole relation which conquered provinces bore to the central state was the payment of tribute, and the so-called Mexican empire was an exceedingly loose aggregation of conquered tribes.

The wars of the Aztecs were conducted with considerable skill, the army being organized into distinct companies, each led by a chief with appropriate banners and devices, while the national standard was brilliant with its embroidery of gold and feather-work. They advanced to battle singing and shouting their war-cries, and displayed all the strategy of guerrilla warfare. Their wars were, in fact, crusades incited by religious enthusiasm, and the warrior who fell in battle was believed to be at once transported to the realms of bliss. Yet the object of the wars was not religious propagandism, but the capture of prisoners to be offered up as sacrifices to their deities. Hence in battle they sought rather to take prisoners than to kill, and they never scalped their slain foes like the northern Indian tribes. Their military code was stern. Disobedience of orders was punished with death, and the soldier who left the ranks in battle was liable to the same penalty. Their offensive weapons consisted of slings, bows and arrows, javelins, and darts. They were expert bowmen, but their most formidable weapon was the javelin, which they used with great skill. Their weapons were pointed with bone, or with obsidian, which takes an edge like a razor. The defensive armor consisted of a close cotton tunic two inches thick, in addition to which they wore wooden or leathern helmets and light shields of wood or quilted cotton. Over this armor the chiefs wore a rich mantle of the gorgeous Mexican feather-work, and plumes of brightly-colored tropical feathers on their heads.

The Aztec state was still in process of formation at the period of the Spanish invasion. Its boundaries were rapidly extending, but the territory it then included cannot be clearly defined. It was, perhaps, about twice the size of New England, or something less than 16,000 square leagues. Yet this country embraced every variety of climate and yielded the products both of the torrid and of the temperate zone. As to the number of inhabitants of this state there are no existing records. Morgan estimates the inhabitants of the Valley of Mexico at less than 250,000, and of the city at 30,000, basing his estimate on the probable agricultural production of the territory (*Ancient Society*, p. 195). This is much less than the estimates made by the Spanish historians.

Social Conditions.—There is reason to believe that the Aztecs had advanced but little, if any, beyond the Pueblo Indians of New Mexico in their social organization. The utter destruction of their dwellings and institutions, and the vague and ill-considered expressions of the early Spanish historians, leave us but little evidence on this point; yet it is probable that, at least in their cities, some of the people dwelt in large communal residences like those of the Pueblo Indians. Several of the latter still exist, solidly built of stone, containing from 100 to 600 apartments, and capable of containing from 1000 to 4000, or even more, inhabitants in a single mansion. None of the Aztec mansions now exist to compare with these, but in Central America, to the south of the Aztec kingdom, are many remarkable ruins, the work of a people considerably advanced in architecture. These ruins have been most probably misapprehended by the travellers who have visited them, and who speak of them as palaces and temples, the centre of cities of which no trace remains. Yet, as Mr. Stephens is satisfied, at the time of the Conquest the Indians were actually living in these cities (*Incidents of Travel in Yucatan*, ii. 348). Mr. Morgan takes a completely different view of these ruins. The buildings, elaborately decorated and solidly built as they are, present many points of resemblance to the New Mexican *pueblos*, particularly in their size and in the character of their numerous apartments. There is little either in history or in existence to indicate that cities surrounded them, while certain expressions of the Spanish explorers go to show that they were the habitations of the people who built them. This question, however, needs further evidence before it can be settled. Many of them were certainly not communal residences. Of the dwellings of the Mexicans we know nothing. They erected pyramids in stages, not unlike the pyramidal platforms of the Central American buildings; and the fact that a dwelling was given to Cortes in the city of Mexico large enough to accommodate his whole force of 1450 men certainly indicates that the cities of Mexico, like "the seven cities of Cibola," may have been merely groups of large communal residences.

That the lands were held and cultivated in common there is no reason to doubt. We have express statements to this effect from Clavigero and Herrera. The former says the cities were divided into districts, each of which possessed a fixed amount of land, which could not be alienated. The latter declares that the land belonged to all in common, and that the cultivator of any portion of land could not sell it, though he could leave it to his sons and heirs. These brief statements indicate a condition of the landed property analogous to that of the village communities of India and of ancient Germany, with a step of progress towards the next stage of landholding, that of personal ownership and hereditary transmission. The growth of personal wealth, outside of landed property, seems to have been rapidly on the increase.

In other respects there was considerable advance in civilization. Polygamy, though permitted, was not widely practised. Marriage was celebrated with much formality, and divorce could be obtained only through the action of courts instituted to consider questions concerning marital relations. The discipline of children was exceedingly severe, particularly in the public schools. Among the people there were many of the habits of cultivated races. Presents of flowers or of more costly articles were frequently given, social visits and festivities were common, and at their entertainments great punctiliousness was observed. The halls of their banquets were scented and strewn with flowers, cotton napkins were used, and ewers of water were presented for ablution both before and after eating. Their food on such occasions consisted of game, fruit, and vegetables prepared with delicate sauces and seasoning, and followed by confections and pastry. Vases of silver and gold and drinking-cups and spoons of the same material adorned their tables, and music and dancing closed the entertainments. Yet the same people, in obedience to the dictates of a bloodthirsty religion, often varied their entertainments with cannibal repasts, in which the flesh of the victims to their gods was eaten, not in the coarse manner of ordinary cannibals, but with all the refinement of manner above indicated.

There were no shops in Mexico, but the products of the country were offered for sale or exchange in the market-places of the principal cities, while fairs for traffic were held every fifth day. Their money consisted of quills of gold-dust, of bits of tin shaped like a T, and of bags of cacao. There was no distinction of castes among the people; labor was held in high estimation, but the most highly respected civil occupation was that of the merchant, who made journeys with rich stuffs, jewelry, slaves, etc. to the utmost borders of Anahuac (the Aztec name of the kingdom). These journeys were made in caravans powerful enough to defend themselves from aggression, while the state was always ready to protect them. The merchants indeed enjoyed peculiar privileges, were consulted by the monarch, held their own courts, convened armies for their own defence, and composed a strong and highly important guild, which promised in time to become an aristocracy of wealth.

In addition to these mercantile journeys, communication between the different parts of the country was kept up by couriers. Post-houses were established about two leagues apart on the great roads, and relays of couriers were placed at these stations, so that despatches were borne throughout the kingdom with great speed. These couriers, trained from infancy to swift running, travelled so rapidly that fresh fish were often served at Montezuma's table twenty-four hours after being taken from the Gulf of Mexico, 200 miles distant. The couriers bore also military intelligence, and their dress denoted by its color to the inhabitants the character of their tidings, whether favorable or adverse.

Industries.—The Aztecs lacked the horse, the ox, and the other domestic animals which have aided so greatly in the progress of civilization. Yet considerable progress was made in agriculture by the unaided labor of the people. Maize was their important grain, and was principally cultivated by the men, the women assisting in the lighter labors of the field. There was partial irrigation, exhausted fields were permitted to lie fallow, and severe penalties hindered the destruction of the forests. Ample and well-constructed granaries were built to receive the harvests. Among the products of the country much attention was given to the banana and to the cacao, the Aztecs being particularly fond of chocolate. Sugar was obtained from Indian corn, which yields more saccharine matter in the tropics than in temperate regions. The American aloe was also largely cultivated, it furnishing paper, an intoxicating beverage called *pulque*, thatch for their dwellings, thread, cord, pins, and needles, while its root formed a palatable food.

Mining was also largely conducted, silver, lead, tin, and copper being obtained from regular galleries sunk in the rocks, while gold was gathered from the surface or from river-beds. Iron, though abundant, was unknown, and their only metal tools were formed of bronze, which, however, was made very hard, so as to serve many of the purposes of steel. They also used obsidian, a dark, glassy mineral which fractures with an edge keen enough to serve as a razor. The mechanic arts were considerably advanced, and the precious metals were worked with great skill and delicacy. Some of their vessels imitated animal forms so neatly that the feathers of a bird or the scales of a fish were produced by alternate layers of gold and silver. They were also expert in the manufacture of pottery and in the production of woven fabrics, which they colored with the brilliant crimson of the cochineal. But their most striking products were their fabrics of feather-work. In these the gorgeous plumage of tropical birds, from the parrot to the brilliant humming-bird, was skilfully laid on cotton cloth, forming designs remarkable for taste and beauty.

Arts and Sciences.—The language of the Aztecs was of the polysynthetic type common to all the American Indians, but it had been improved beyond the crudity of the dialects of the more barbarous tribes. What may be called *picture-painting* was practised to some degree by all the North American tribes, but in Mexico this art had developed into a low stage of hieroglyphic writing. The idea of distinct pictures was still shown in their characters, though these were approaching the outlined and conventional stage of the true hieroglyphic. There were few indications of symbolic writing, so largely exhibited on Egyptian manuscripts. This imperfect art was largely employed, their laws, domestic regulations, political annals, religious observances, etc., being minutely recorded. The writing was performed on paper variously prepared from cotton cloth, from fine skins, and from a composition of silk and gum, but principally a fine fabric from the leaves of the aloe, which formed a paper said to be more soft and beautiful than parchment. The characters were rapidly painted by persons instructed in the art in the colleges of the priests, the manuscripts being formed into volumes not unlike a book in appearance. Multitudes of these manuscripts were in existence at the time of the Spanish conquest, but they were ruthlessly destroyed, and the first archbishop of Mexico is said to have burnt a "mountain-heap" of them in the market-place of Tlatelolco. But few of them yet exist, and these are practically useless, since no key to the characters remains. Besides the hieroglyphic writings the traditions of the country were embodied in songs and hymns carefully taught in the public schools.

They had a simple system of notation, quite sufficient for all their needs, the larger numbers being reckoned by twenties, with separate signs for the square and the cube of twenty. Their most advanced scientific progress lay in their chronology, in which they indicated the true length of the year with admirable precision. The year was divided into eighteen months of twenty days each, with five complementary days to make up the full number. The month was divided into four weeks of five days each. To make up for the loss each year of nearly six hours, thirteen days, or more probably twelve and a half days, were inserted at the end of every fifty-two years. This made their calendar so nearly perfect that more than five centuries must elapse before the loss of an entire day. The epoch from which they reckoned corresponded with the year 1091 of the Christian era, being that of the reform of their calendar. There was, in addition to the solar, a lunar calendar, in use by the priests to regulate their festivals. Astrology was also greatly practised by the Aztecs.

The termination of the period of fifty-two years was solemnized by a remarkable festival. Apprehensions were entertained that the world would be destroyed at the end of such an epoch, and on the arrival of the five "unlucky days" which closed the year they gave themselves up to despair. The images of the household gods were broken, the holy fires allowed to go out in the temples, the household fires extinguished, their furniture and garments destroyed, and everything thrown into disorder, for the evil genii were coming. On the evening of the last day the priests moved in procession to the top of a neighboring mountain, taking with them a noble victim. He was sacrificed just at midnight, and the *new fire* kindled by the friction of sticks placed on his breast. This was communicated to a funeral pile on which the body of the victim was thrown. As the flames flashed up, shouts of joy rose from countless multitudes who had their eyes fixed on the mountain-top. Couriers, with torches lighted at this flame, bore the fire rapidly to all parts of the realm, and long before the sun arose the new fire was blazing on altar and hearthstone far and wide throughout the kingdom. The succeeding thirteen intercalated days were given up to festivity, to joyous processions, and to thanksgiving offerings, as if the world indeed had gained a new lease of existence.

The Aztecs had also attained considerable proficiency in the arts of sculpture and architecture. Their sculptured figures were so numerous that the foundations of the cathedral in the great square of Mexico are said to be entirely composed of them. They delineated the forms of animals with great accuracy, but their human figures were grotesque or hideous. This was more probably from design than from lack of ability. The most remarkable existing piece of Aztec sculpture is the great Calendar-stone, an immense circular block of carved stone, weighing nearly fifty tons, which was dug up in 1790 in the great square of Mexico. The theory, so long entertained, that the inscriptions on this stone represent the Aztec calendar, is rejected by recent authorities, who consider that it was simply a votive offering. As evidence of the ability and energy of the Aztecs we may mention that this huge block had been brought to the city from a distance of many leagues over a country intersected by water-courses. In crossing one of these streams the supporting bridge gave way and the great block fell into the channel, whence it was with difficulty recovered. Yet this immense mass was transported by human labor alone, as they had no beasts of burden.

We have already spoken of their architecture, of which, unfortunately, but few traces remain, though several of the pyramidal bases of their temples yet exist. These appear to be solid artificial structures of stone or sun-dried bricks, and are somewhat like the Egyptian pyramids in form. In many cases the bases were more than 100 feet square, and the height considerable. They were erected in four or five stories, with a terrace at the base of each story and flights of steps leading upward. The top was a broad area, on which were erected towers, the sanctuaries of the deities. Before these towers stood the stone of sacrifice and two lofty altars on which inextinguishable fires burned. One of these pyramidal structures, more than 160 feet high and about 1400 feet square at the base, still stands in the town of Cholula. Their formation in terraces assimilates them in character to the mounds on which the great edifices of Central America are erected.

Religion.—The religion of the Aztecs forms the most remarkable feature of their civilization, as it is by far the most bloodthirsty system of worship which the world has ever known. Of their many gods there were two to whom special reverence was paid, and these were strikingly different in character. One was the terrible

Huitzilopochtli, the god of war, who was propitiated with endless hecatombs of human victims. The other was Quetzalcoatl, the beneficent god of light and of the air. His reign upon the earth was the golden age of Anahuac, when the earth yielded fruits and flowers spontaneously, the cotton took rich hues as it grew, and an ear of Indian corn was a load for one man to carry. This deity taught the people the arts of mining, agriculture, and government. He was tall, white, with long hair and a flowing beard. Eventually, he left the land in an enchanted boat by the waters of the Gulf of Mexico. The Aztecs looked confidently for his return, and were disposed to identify Cortes with their vanished deity. This was one main cause of the rapid success of the Spanish.

In the Aztec ideas of the future they imagined a series of cycles of several thousand years' duration, each to be followed by the destruction of mankind and of the solar sphere, while a new cycle would be inaugurated by a rekindling of the sun. There were to be three stages of future existence. The wicked were to dwell in a place of everlasting darkness; a second class, whose only merit was that they died of certain diseases, were to enjoy a state of indolent content. The highest place was given to the heroes who died in battle or in sacrifice. They passed at once into the presence of the sun, whom they accompanied with song and dance in his bright passage, while eventually their spirits went to revel among the rich blossoms and odors of Paradise.

The religious observances were conducted by a large body of priests, who formed the most important class of the people. It is said that 5000 priests were attached to the principal temple of the capital. Each of these had his duties, one of the most important of which was the education of the youth, which was entrusted solely to the priesthood. The discipline of their schools was very severe, and certain offences were punished with death. Confession and absolution were rites of the Aztec Church. The first was heard but once in life, and was usually deferred to a late period, since any subsequent sin could not be expiated. Priestly absolution relieved a criminal from legal punishment for his crime. But the most extraordinary feature of the Aztec religious rites was that of sacrifice. Human sacrifices are said to have been adopted about two hundred years before the Conquest. Rare at first, they increased in number until they became terribly numerous. The sacrificial stone on which these massacres were performed was a huge block of jasper, with its upper surface somewhat convex. On this the prisoner was stretched and securely held by five priests, while a sixth, armed with a sharp razor of *itztli*, or obsidian, opened the breast of the victim and, inserting his hand, tore out the bleeding heart. This he first held up towards the sun, and then cast at the feet of the deity to whom the temple was devoted. Even women and children were sometimes thus sacrificed. But the most horrible part of the story is the fact, already adverted to, that the body of the victim was delivered to the warrior who had taken him in battle, to be served up in an entertainment to his friends. Different authors estimate the annual sacrifices at from 20,000 to 50,000. On such important occasions as the crowning of a ruler or the dedication of a temple the number of victims became absolutely appalling. At the dedication of the great temple of the war-god in 1486 the prisoners, who had been reserved for several years, formed a procession nearly two miles long. The murderous ceremony occupied several days, and 70,000 victims are said to have perished. These numbers are given by the old Spanish chroniclers, but are no doubt greatly exaggerated. The victims were principally captives taken in battle, the wars of the Aztecs being conducted quite as much for the purpose of taking prisoners to sacrifice to the gods as to extend their empire. Hence an enemy was never slain in battle if there was a chance to take him alive—a fact to which the Spaniards often owed their preservation.

History.—The history of the Aztecs is involved in much obscurity, our knowledge of it being based upon traditions which are vague and very probably inaccurate. The civilized tribes of Mexico seem to have entered it by migration from the north. Tradition ascribes them to some mysterious northern realm called Aztlan, but its location remains unknown, if it is not altogether fabulous. The first traditional migration was by a race called the Toltecs, supposed to have entered Mexico before 700 A. D. Considerable civilization is ascribed to this people, and they are credited with the origin of all the arts of the Aztecs. They were great builders, and many existing ruins are ascribed to them. After four centuries, during which their dominion was widely extended, they completely disappeared in consequence of famine, pestilence, and defeat. It is considered possible that some of them may have become the great builders of Central America. According to some traditions, they had been preceded in the valley of Mexico by a ruder tribe called the Chichimecs. Others, of higher civilization and speaking a Toltec dialect, followed. The most noted of these were the Aztecs, and the Acolhuans, known in later times as Tezcucans. The latter were a mild race, who established a dominion of considerable extent. The Aztecs made their first appearance near 1300 A. D. They were a fierce and vigorous race, who, after a migratory and adventurous period, finally settled on the south-western borders of the principal lake of the Mexican Valley in the year 1325. They there beheld, perched on the stem of a prickly pear, a magnificent eagle, with wings spread to the rising sun and a serpent clutched in his talons. Taking this as a favorable omen, the foundations of their city were laid by sinking piles in the marshes. From this beginning a firm island in time arose, intersected by canals and covered with the edifices of a flourishing city, which was connected by long earthen causeways with the mainland. Isolating canals and drawbridges rendered these causeways easily defensible. Thus favorably situated, they strengthened themselves at home and soon gained a reputation abroad for courage and cruelty.

Shortly after the year 1400 the Tezcucan state was overthrown by a tribe called the Tepanecs. It was reestablished by the aid of the Aztecs. Then was formed that vigorous confederacy which was the basis of the Mexican state. An alliance offensive and defensive was made between the Aztecs, the Tezcucans, and the smaller tribe of Tlacopans, which resulted in a rapid extension of their dominion. The mountain-girdled valley of Mexico was soon subdued, and by the middle of the fifteenth century, under the first Montezuma, their dominion was extended far over the Mexican table-land. Tribe after tribe fell before them. Spoils and captives flowed abundantly into the capital city. By the year 1500, just before the arrival of the Spaniards, their dominion reached from the Atlantic to the Pacific, and their conquering arms had been carried far into the remote regions of Guatemala and Nicaragua. In these wars the Aztecs were the predominant power, their allies being thrown into the shade, and there were indications of an overthrow of the confederacy and a seizure of the complete power by this vigorous and warlike race.

In the year 1519 the Spaniards, under Hernando Cortes, made their appearance on the coast, and in an incredibly short space of time this widespread and populous kingdom was overthrown and its capital conquered by a handful of Europeans. There were many causes for this extraordinary success, of which the vigor and the superior arms and discipline of the invaders were but one. The superstitious idea of the people that the white-faced strangers were their vanished deity and his companions, whose return was looked for, aided the Spaniards' success. But their principal aid lay in the constitution of the Aztec state. It was in no sense a consolidated kingdom, but a mere aggregation of conquered tribes, held by terror and hating their dreaded oppressors. Hence the shrewd Spaniards had no difficulty in obtaining allies and in dividing the kingdom against itself. It was thus, by availing themselves of the services of the foes and the hostile subjects of the Aztecs, that the Spaniards succeeded, first in overthrowing the latter, and then in reducing their allies to servitude, and in establishing that heartless despotism which destroyed in a few centuries every vestige of a once-flourishing civilization and reduced its subjects to a state of hopeless slavery.

The Aztec dominion, as thus briefly reviewed, presents a strange combination of the elements of savagery, barbarism, and civilization. It is interesting as arising independently of the civilizations of Europe and Asia, and yet closely resembling them in many of their archaic features. It was the true outcome of the condition of the North American Indians when subjected to the influence of settled life and agricultural habits. The Aztec confederacy was a tribute-paying aggregate held together by terror. It somewhat resembled in this respect the ancient Persian empire in Asia, and was less coherent than the Assyrian. The organization of the people was very probably that of the *gens*, as in the Indian tribes and in early Greece and Rome. In accordance with this organization, communism in land and dwellings very probably prevailed, though the idea of individual ownership was doubtless growing and the ownership of merchandise was fully individual. The government perhaps did not differ materially from that of the northern tribes, though the authority of the chiefs and sachems of the latter was in Mexico augmented by the influence of wealth, of religious sanction, and of usurped prerogatives. The ruler was the war-sachem, elected, as in the *gens*, from the brothers or nephews of the deceased ruler. But the power of this ruler had greatly increased through the rapid extension of the state and the growing subordination of the people, until in several respects his authority had become absolute. A despotic state was in process of formation out of a democratic organization, such as still exists in the northern tribes. The religious institutions of the Aztecs constituted a barbaric polytheism, while its savage immolation of victims points back to the torture of captives by the ruder tribes. Evidently, with the growing influence of the priestcraft the ceremonies of religion had been thrown around the slaughter of the captive, until the state became a huge and terrible machinery for the capture and sacrifice of human victims to their insatiable god of war. Yet outside of this, in their social habits, their industries, and their arts the Aztecs displayed many of the instincts and achievements of civilization. (For further particulars concerning this interesting people consult Prescott's *Conquest of Mexico* and Bancroft's *Native Races of the Pacific States.*) (C. M.)

AZYMITES (Gr. α privative, and ζύμη, leaven), a name first given to the Roman Catholics by Michael Cærularius when in the eleventh century the Greek Church, separating from the Western, made the objection that the latter used in the Eucharist unleavened bread. The name came into general use by the Greeks after the unsuccessful attempt at the Council of Florence in 1439 to reunite the churches. Since that time the use of leavened or unleavened bread has constituted an essential difference between the two churches, and the Latins on their side call the Oriental churches Prozymites. Roman Catholic divines maintain that as Christ instituted the Eucharist on the eve of the Passover, he could not then have used leavened bread, because the Jewish law required all leaven to be carefully removed beforehand. The Greeks regard this abhorrence of leaven as a relic of Judaism. The Council of Florence decided that either leavened or unleavened bread might be used, and that the priests of each Church might follow their own custom. When the practice of using other than common bread arose in the West is not certain, but it does not seem to have existed before the ninth century. In the East the Greeks, Syrian Jacobites and Maronites, Copts, and Nestorians use leavened bread in the Eucharist, and in the West, while the Roman Church requires the use of unleavened bread, Protestants generally use common or leavened bread. Unleavened bread is also used by some of the more advanced Anglicans.

B.

BABINET, JACQUES (1794–1872), a French physicist, astronomer, and meteorologist, was born at Lusignan, France, March 5, 1794. In 1811 he entered the Lycée Napoléon, where he was a pupil of M. Dinet, and in Oct., 1812, passed to the Polytechnic School. After further training at Metz he entered the imperial army, Oct. 1, 1813, as a sub-lieutenant of artillery. His military career was brought to a close by the downfall of the Empire in 1815. In Oct., 1816, he became professor of mathematics at Fontenay, in Vendée, and a year later obtained his diplomas as bachelor both of arts and of sciences. He was next professor of physics at Poitiers, and in 1820 was appointed to a similar position in the College of St. Louis at Paris, which he held till his retirement in 1869. In 1825 he began a course of lectures at the Athenæum on meteorology, and he afterwards claimed to have caused the adoption of the word "météorologie" as the name of that science. His mechanical talent enabled him to improve many scientific instruments, as the pneumatic machine, and he invented a hygrometer, a goniometer to measure the refraction of transparent bodies, and a photometer, still used to measure the intensity of illuminating gas. He became a member of the Academy of Sciences in the section of physics in Feb., 1840. Though constantly engaged in the promotion of physical science, he was fond of the classics, and could recite whole pages of Homer and Hesiod. He died at Paris, Oct. 21, 1872.

His first publication was in 1822, when, in company with the illustrious Ampère, he prepared an account of the recent discoveries in electricity. His numerous memoirs on various branches of science were published chiefly in the *Annales de Physique et de Chimie* and the *Comptes Rendus* of the Academy of Sciences. His papers on meteorological subjects treat of *Terrestrial Magnetism* (1829), *Parhelia, Halos, and the Rainbow* (1837), *The Currents of the Sea* (1849), *Modification of Laplace's Barometric Formula* (1850), *Temperature and the Development of Plants* (1851), *Rain and Freshets* (1855). He labored to diffuse scientific knowledge among the people, and published many articles on astronomy, physics, and meteorology in the *Revue des Deux Mondes*, the *Journal des Débats*, and other periodicals. He also published a treatise on *Descriptive Geometry* and *Studies and Lectures on the Sciences of Observation, and their Practical Applications*. The latter comprises eight volumes, and was chiefly composed of public lectures delivered in the Academy of Sciences. Under his direction an *Atlas* was prepared containing what he called *Cartes homalographiques*, which by a new system of projection preserved the exact proportion between the actual surfaces on the globe and the spaces on the map.

BABINGTON, CHURCHILL, D.D., an English clergyman, author, naturalist, and archæologist, was born in 1821. He is the son of Rev. M. L. Babington, rural dean of Ackley, Leicestershire. He was educated at Cambridge, and in 1843 took a first class in classical honors at St. John's College, of which he became a fellow in 1846. In that year his essay on *The Influence of Christianity in Promoting the Abolition of Slavery in Europe* won the Hulsean prize. In 1858 he published a pamphlet refuting some of Lord Macaulay's statements with regard to the clergy in the seventeenth century. In 1865 he was elected Disney professor of archæology, and in the next year was presented by his college to the rectory of Corkfield, Suffolk. In 1866 he published his introductory lecture on archæology. He has edited from recently discovered manuscripts *The Oration of Hyperides against Demosthenes*, *The Orations of Hyperides for Lycophron and Euxenippus*, *The Funeral Oration of Hyperides*. He has also edited Bishop Peacock's *Repressor*, and in the series of historical works brought out by the British Government he edited Higden's *Polychronicon*. He reproduced in fac-simile the *Beneficio di Cristo*, attributed to Paleario. He contributed to Smith and Cheetham's *Dictionary of Christian Antiquities*. In 1880 he resigned his professorship and was elected an honorary fellow of St. John's College.

BABYLONIA AND ASSYRIA. The progress of Assyriology during the last four or five years (1878–82) has been considerable in all its departments. It is proposed here to give a brief outline of the explorations thus far made in the basins of the Euphrates and Tigris, and then to review some of the chief results of recent Assyriological study into the cuneiform inscriptions.

See Vol.III. p. 159 Am. ed. (p. 183 Edin. ed.).

The arrow-head or cuneiform writing of the Persians, which became the key to that of the Babylonians and Assyrians, was observed and described by travellers in the seventeenth and eighteenth centuries (De Figueroa, 1618; Della Valle, 1621; C. Niebuhr, 1765). Niebuhr, in particular, brought back rich material for the decipherer in the shape of copies of the inscriptions at Persepolis. But not till 1820, when Rich, Resident of the East India Company at Bagdad, visited Mosul, and made a cursory examination of the mounds of Nebi Yunus and Koyundjik (Nineveh), sending to England a small box of stone fragments as the proceeds of his labor, was there in Europe any real acquaintance with Assyrian, much less Babylonian, remains. Later discoverers in Assyria were the Frenchmen E. Botta (1843–45) and V. Place (1852), who explored Khorsabad, 15 miles N. E. of Mosul, and who laid bare the great palace of Sargon; A. H. Layard (first expedition, 1845–47; second expedition, 1849–51), who made important discoveries on the site of Nineveh; H. Rassam (with Layard on both expeditions; alone, 1852–54), who brought to light the famous library of Asshur-bani-pal (B. C. 668–626); Loftus (1854), whose chief work was in Babylonia (see below); G. Smith (first exped., 1873; second, 1874; third, 1875–76), whose brilliantly-successful labors hastened his death; and Rassam, again, in several expeditions since 1877. In 1878 this veteran explorer made fresh excavations at Koyundjik and Nimrûd (ancient Calah), discovering in the former mound a cylinder inscription of Asshur-bani-pal containing nearly 1300 lines, and in the latter the remains of a splendid temple, with marble altar, dating from the time of Asshur-natsir-pal (B. C. 883–860). In the same year he turned his attention to a mound near Balawat, a village some 15 miles east of Mosul and 9 miles north-east of Nimrûd. Excavations in this place were attended with extreme difficulty, since the mound was a burying-place for the neighboring Shabbak Kurds. Thanks to Rassam's patience and diplomacy, however, his work suffered no great interruption, and his toil was rewarded by the discovery of the bronze sheathing of the gates of a palace of Shalmaneser II. (B. C. 860–825), and a second temple of Asshur-natsir-pal. This temple contained, besides a marble altar and a marble bowl, a coffer, also of marble, which served as a receptacle for two inscribed slabs. A third slab was lying upon the altar, but there was no room for it in the coffer. The inscriptions on these slabs celebrate the achievements of Asshur-natsir-pal, and contain the name of the ancient city buried beneath the mound of Balawat—*Imgur-Bel*. (See papers of Rassam and Budge, *Trans. Soc. Bibl. Archæol.*, vii. 1.)

The exploration of Babylonia began somwhat later than that of Assyria. Layard made some unimportant discoveries there in 1850–51. A French expedition under Fresnel and Oppert (1851–54) met with good success in the matter of discovery, but lost the greater part of the treasures found by the capsizing of a boat in the Tigris. They were followed by Loftus and Taylor (1853–55), the general supervision of the work both in Babylonia and Assyria being at that time in the hands of Henry (now Sir Henry) Rawlinson, then British consul-general at Bagdad. From this time until 1874 scarcely anything was discovered in Babylonia, and even then it was not as a result of a well-planned and equipped expedition that the clay jars, packed with contract-tablets, were found in the ruins of Babylon and sent to England. Since 1878, however, Rassam has been laboring in Babylonia, and has not only added greatly to the number of these contract-tablets, but also brought to light several ancient libraries, with inscriptions of all kinds and great value. One of Rassam's most brilliant achievements occurred during his expedition of 1880–81—the discovery in the vast mounds of Abu Habba, south of Bagdad and about halfway between that city and Hillah (Babylon), of Sippara, the "city of the Sun." In the archive-chamber of a temple Rassam found an inscription, preserved in a coffer, like those at Balawat, which named the temple, city, and the author of the inscription himself—Nabu-bal-idinna (beginning of the ninth century, B. C.). He succeeded also in identifying the site of Cutha.

Finally, but not least important, there remain to be mentioned the arduous and successful labors carried on since 1877 by the French vice-consul at Bassorah, M. de Sarzec. His explorations in Lower Babylonia have been conducted in the face of danger from hostile neighbors, and still greater danger from the pestilential swamps of the Euphrates; the mound Tell Loh, on the canal Shatt-el-Hai, was the scene of his work, and it yielded to him a rich return in the shape of statues, bas-reliefs, and inscriptions of inestimable value for the history of the earliest Babylonian civilization. His collection is now in the Louvre. In the following columns the chief results of all the later discoveries and study of the records are given under their appropriate heads.

Geography.—In Assyria the sites of Asshur (*Kileh Shergat*) and the more northern triad of cities, Calah (*Nimrûd*), Ninua or Nineveh (*Nebi Yunus* and *Koyundjik*), and Dur-Shargina (*Khorsabad*), have long been known. The addition of Imgur-Bel (*Balawat*), which must have been an important city in the ninth century B. C., makes this triad into a tetrapolis. In Babylonia it is now clearly established that the territory of Accad covered the north-western part of the country, and Shumir, or Sumir, the south-eastern. Accad thus bordered on Assyria to the northward, the boundary-line between the two lying (with some fluctuations) a little south of the lower Zab. The line between Accad and Shumir cannot be exactly drawn at present. The city of Erech (*Warka*) belonged to Accad, that of Ur (*Mugheir*) to Shumir; the point of division on the Euphrates must therefore be sought between these two (*circ.* lat. 31° +); further than this we cannot now say. At all events, Babylon was in Accad, and so, of course, were Borsippa, Cutha, Agade, Sippara, and the other northern cities. Reference has been made above to Rassam's identification of Cutha and discovery of Sippara. Cutha is where Sir H. Rawlinson had already located it, at *Tel Ibrahim*, about 10 miles east of Babylon; Sippara had been previously supposed the original of *Sifeirah*, due west from Bagdad and near the Euphrates; Rassam's discovery (see above) places it 30 miles south of Bagdad, at a considerable distance from the Euphrates, on an old canal-bed called *Ruthwanich*. This appears to show that in ancient times the Euphrates, which is repeatedly designated in the inscriptions as the "river of Sippara," and must therefore have passed near it, held northward from Babylon a more easterly course than at present. Not due to recent discoveries, but worthy of mention, is the fact that the modern Bagdad is the successor of an ancient city known as *Bagdadu* as early as the twelfth century B. C., and possessed of a non-Shemitic name besides, *Eshêb*, which shows that it probably originated long before that century.

Besides this division of Babylonia into Shumir and Accad, other provincial names, of more or less definite application, have been attached to different parts of the country. Over some of these there is still much dispute. It is probable that the name *Karduniash* was given to the district immediately surrounding Babylon. The region about the shore of the Persian Gulf was called *Bit Jakin* or *Tamdim* by the later Assyrian kings. It is contended, and with strong arguments, that Northern Babylonia was also known as *Melucha*, and Southern Babylonia as *Makan*, but this is not as yet universally accepted; some still hold that these names, which are at times applied to Ethiopia and Egypt respectively, never denote anything else. It has also been proposed to find in the name *Caldi* (Chaldæans), used for inhabitants of Babylonia from the ninth century B. C., the Assyrian form of an original *Cashdi* and *Cashdu*, a designation for people and land (cf. Ur Casdim, Gen. xi. 28, etc.), and to bring this into connection with the *Cush* of Gen. ii. 13; but the latter point, at least, is at present a mere hypothesis.

In ancient times the two great rivers of Babylonia and Assyria emptied into the Persian Gulf by different mouths. The sea, which has long since retreated from the coast-line then bounding it, covered, in the shape of a deep gulf, the ground where they now unite and through which they flow as one. The island-city *Dilmun*, situated probably not far from the entrance to this gulf, was the southernmost city of Shumir.

It is interesting to notice that the study of the pre-Shemitic language of Babylonia (see below) seems to have determined the etymology of the ancient river-names, Purattu (*Euphrates*) and Idiklat (*Tigris*). The Accadian name for the Euphrates was *Pura-nunu*,—"great river" (*pur* = "deep," "vessel," "channel," "river"). The Shemitic Babylonians employed the same word, *Pura*, without the adjective *nunu*, adding the termination of a Shemitic feminine. *Purattu* means, therefore, "*the* river" *par excellence*. By a similar adding of the feminine termination *Idiklat* was produced from the pre-Shemitic *Idigla* (?), *Idigna*. *I-dig-na*, the Accadian name for the Tigris, is made up of *I* (for *id*) = "river;" *dig* = "border," "bank;" and *na* = "high." *Idigna* = *Idiklat* means, therefore, "river with high bank," or perhaps "river-channel," "river," like *Pura*.

The notable limitations of the geographical knowledge possessed by the Babylonians and Assyrians appear when we consider that although they knew Elam, Media, Armenia, Syria, Egypt, Arabia, etc., and had names for the Mediterranean, as well as for the lakes of Van and Oroomiah and the Persian Gulf, there is no indication on the monuments of an acquaintance with the Black or Caspian Sea nor with Eastern and South-eastern Asia.

Ethnology and History.—The origin and previous history of the pre-Shemitic inhabitants of Babylonia are wrapped in uncertainty. It is exceedingly doubtful whether they were connected with the Ural-Altaic (so-called Turanian) family: the philological argument in favor of this view—the only argument of importance—appears not to bear a searching examination (see below). On the other hand, the theory of Lepsius (*Nubische Grammatik*, 1880, Einleitung), that they came from the shores of the Red Sea, and were Cushites, related to the *Puna* of the Somali coast and Southern Arabia, cannot be said to have any strong probability in its favor. We may, however, fairly remind ourselves that when Berossus speaks of Oannes as coming from the sea (Persian Gulf) and bringing culture to the people, a certain truth underlying this legend seems to be confirmed by the probable fact that the Shumirians, who dwelt in Southern Babylonia along the coast, spoke an older dialect than the Accadians, and were therefore presumably a more ancient tribe. This, taken in connection with the apparently close historical relations between Accad and Elam, suggests the question, which we are not yet able to answer, whether it is then impossible that the two ancient Babylonian tribes had a different origin. The similarity of language would not necessarily be an absolute bar to such a supposition.

The early history of Babylonia has been lately enriched by the discovery of long lists of Babylonian kings, as well as inscriptions and other monuments from some of these. It is, however, not yet possible to reconstruct the statements which have been generally made in regard to the early period, so as to bring them into anything like a final form. The question of dates is here, as commonly, one of the most difficult. If we are to credit a statement made by Nabonidus in a recently-deciphered inscription (Pinches, *Proceedings Soc. Bib. Arch.*, Nov., 1882), there was a well-developed civilization in Babylonia nearly 4000 years B. C. Nabonidus relates that he made excavations beneath the temple of the Sun at Sippara, and after much labor found "the cylinder of Naram-Sin son of Sargon, which for 3200 years no king before me had seen." Reckoning back from B. C. 550, the time of Nabonidus, we find that Nabonidus places the reign of Naram-Sin *c.* B. C. 3750. We do not, however, know the data by which he fixed this date, and must for the present regard it as very uncertain.

The discovery of the bronze gates at Balawat (see above) supplies us with the most important among the newly-recovered documents of Assyrian kings. The inscription is concerned with the first nine years of Shalmaneser II. (B. C. 860–825), and gives many details of his campaign in Babylonia, as well as an account of other expeditions.

It should be further remarked that there is good ground for identifying the Tiglath-Pileser of the Bible (B. C. 745–728) with Pul, the latter being his private, the former his royal, name. (See Schrader, *Keilinschriften u. Geschichtsforchung*, 1878; *Keilinschriften u. d. Alte Testament*, 2d ed. 1883.)

But it is the late Babylonian empire, and especially its close, upon which the labors of the last four years (1879–82) have thrown the clearest light. The silence of the inscriptions concerning the campaigns of Nebuchadnezzar (B. C. 604–562) has been somewhat relieved by the discovery of several cuneiform inscriptions, at least one of them dating from his reign, on the rocks bordering the *Nahr-el-Kelb*, or Dog River, a little north of Beirût in Syria. These inscriptions are all badly defaced, but the largest and best preserved, on which the name of Nebuchadnezzar repeatedly occurs, testifies, at all events, to the presence of the great conqueror's forces on this thoroughfare of ancient armies, and thus confirms the accounts furnished by other sources. Another inscription, on a fragmentary tablet recently deciphered, records a campaign made by the general of the king against "Mitsir" (undoubtedly = *Mutsur*, "Egypt") in Nebuchadnezzar's thirty-seventh year of reign, or B. C. 568. In 572 the king had already reduced Egypt to subjection, and this new expedition was probably occasioned by a revolt. (See Pinches, *Trans. Soc. Bib. Arch.*, vii. 2.)

One of the most important and surprising discoveries of late years for the historian of Babylonia consists of two inscriptions, one on a clay tablet, and the other on a clay cylinder, found and deciphered in 1879 and 1880. These treat of the campaigns of Cyrus and the fall of Babylon, and are the first detailed contemporary accounts in our possession. The earlier statements are confirmed by the new inscription of Nabonidus already referred to. According to these, Cyrus—ordinarily termed "king of Anzan"—after overcoming Astyages, king of Media, and capturing Ecbatana in B. C. 550, subduing Lydia in 547, and carrying on successful campaigns in the East, at length entered Babylonia (Accad) in July (Tammuz), 538. This was in the seventeenth year of the Babylonian king *Nabunahid*, or Nabonidus. This prince had not maintained his empire in full vigor. His supineness had alienated the people at large, and his neglect of the gods and public worship had rendered the priests his enemies. That Nabonidus himself did not admit any lack of reverence and religious zeal on his own part is clear from his inscription in the temple of Sippara, setting forth his labors in restoring that temple (after the exploration referred to above) and enumerating his other pious deeds. Still, this dates no later than B. C. 550, and his habits may have changed. Besides, we cannot tell what part private jealousies and intrigues may have played in his loss of popularity. We know that the priests were a most influential and powerful class in Babylonia, and it was no doubt through their agency, working upon the disaffected populace and army, that the inhabitants of Accad revolted from Nabonidus and welcomed Cyrus. The "king of Anzan" entered Sippara (see above) without striking a blow. He did not at once go to Babylon, but that city was occupied, with scarcely any resistance, by Gobryas, his general, after an interval of two days, probably no more than the time required to march from Sippara. Nabonidus had made his escape at the time of the revolt and the occupation of Sippara, and seems to have taken refuge in Babylon, for he was taken prisoner there by Gobryas. Some four months afterward (3d Marchesvan) Cyrus entered Babylon in person, and appointed Gobryas and others whom he trusted to positions of importance. Nabonidus did not long survive the loss of his empire, but died before the year ended, probably in the latter part of the month Adar (February–March), since he was publicly mourned from the 27th of that month to the 3d of the next, Nisan. Cyrus ingratiated himself with the priests and the people by great attention to the temples and to worship, and by a liberal policy toward subject and tributary nations—quite in keeping with what the Bible tells us as to his treatment of the captive Hebrews. In addition to the information given by this tablet and cylinder we learn from certain dated contract-tablets that as early as 532 Cyrus established his son Cambyses (who had been with him when he first took possession of Babylon) on the Babylonian throne as a sort of viceroy, while he himself was no doubt occupied with new campaigns. From this time on we have little fresh information, except the meagre statement of date, king, etc. in the colophons of the contract-tablets. Some of these have even been found dating from the reign of *A-lik-sa-an-dir* = Alexander.

Art, Science, and Literature.—The temples unearthed by Mr. Rassam at Nimrûd and Balawat (see above) seem to be constructed on a simple plan. The altar, approached by a flight of steps, was the principal object in each. In the Nimrûd temple were also several platforms and three stone chairs. Tiles and ornaments of other sorts, beautifully decorated, had once occupied places on wall or ceiling. Mr. Rassam speaks of finding here also "a perfect and well-built brick arch." The coffer containing inscriptions at Balawat was deposited at the entrance of the temple. Much better preserved than either of these was the great temple of the Sun, "*Ebab-bara*," at Sippara (see above). Here a walled apartment, one hundred feet by nearly thirty-five, contained a square altar, or the lower part of one, built of brick, and so large as nearly to fill the width of the temple. From this apartment a door led into a smaller room, in the floor of which the archive-chest or coffer was found.

The explorations of M. de Sarzec have brought to light valuable specimens of ancient Shumirian art. Among these are six statues, nearly or quite life-size, two in a standing and four in a sitting posture. The material is the hardest diorite; the style quite distinct from the Assyrian, and claimed by some to resemble the oldest Egyptian. The statues are all headless, but two heads were found, apparently broken from other statues—one bare, the other crowned with a turban. The material of these is the same as that of the figures, a hard diorite or porphyry—also, perhaps, Egyptian in character, though Egyptian influence is strongly disputed. Inscriptions on these figures seem to explain these characteristics by saying that the king had them brought from "Maggan" (Makan = Egypt?; see above). Their date is uncertain, but evidently remote.

In Assyria we have to notice once more the bronze gates from Balawat, as illustrating in more than one point the artistic qualities of the nation. The so-called "bronze gates" are really the bands which strengthened and adorned the wooden doors of the palace. The main series passed across the doors horizontally, being affixed to them with nails, still preserved; one end was bent around the doorpost (which turned with the door), the other was concealed beneath vertical strips or plates with which the inner edge of each door was bound. The doors were in pairs, like our folding-doors. The bands from two pairs were found and brought to England, but the smaller set crumbled almost hopelessly to pieces. Of the larger set, the horizontal bands on each door-leaf were seven in number. Each contains two rows of figures, extending their whole length, accompanied generally by brief inscriptions. The edges of the bands are ornamented with little rosettes, the nail-head in the centre. The scenes represented on the bands are taken from the early campaigns of Shalmaneser II.; the figures are raised, and seem to have been made by punching from the back, with finishing-touches on the face. They are all in profile. The total number is immense, and the variety very great. The main inscription, referred to above, is on the bronze edging of the doors. (See Pinches, *Trans. Soc. Bib. Arch.*, vii. 1.) The figures present the well-known Assyrian characteristics, but many of them are singularly well executed. The contrivance of representing the direction of a river's current by causing it to grow shallower toward the source is employed with considerable skill.

In regard to science there is little definite information to be added to that already given. The most noteworthy recent discovery in this department is connected with two of the sitting statues of M. de Sarzec's collection. Each of these holds on his lap a tablet; on the right of it lies a graver's tool, in front a graduated measure. Oppert is authority for the statement that the length of this measure is 271 millimetres, with subdivisions which can be reduced to the scale of 60. This would thus appear to be the old Shumirian unit of measure.

Our acquaintance with Babylonian literature is increasing all the while as new libraries are discovered and their contents deciphered. In some cases Babylonian originals, or older copies, of works known hitherto only through the library of Asshur-bani-pal at Nineveh, have been brought to light. Among these is a Babylonian recension of the account of the Flood; and there are many valuable religious and lexicographical texts besides. The general lines within which the literature of Babylonia and Assyria were developed have, however, been already marked out with sufficient clearness.

Language and Trade.—Fresh interest attaches to the language of the earliest inhabitants of Babylonia from two circumstances: The first is the vigorous revival of an old controversy as to the actual existence of any pre-Shemitic language in this region. The champion of the negative view, J. Halévy, maintains that the so-called Accadian or Shumirian language is nothing but an artificial mode of writing Shemitic words. The impulse to this theory seems to have been given by the difficulty of explaining the origin of the hitherto unknown Accadian or Shumirian people, and of accounting for its presence in Babylonia. To this theory, which seems to owe its force to the great energy of its champion rather than to weighty argument, it is objected that the use of a secret character on such a large scale as the Accadian and Shumirian inscriptions, and in places where the object must have been to proclaim and perpetuate the famous deeds of a king; the demonstrable differences in position and construction of words between the Assyrian and Accadian parallel texts; the demonstrable existence of various dialects in the pre-Shemitic language; the possibility of accounting for many of these dialectic variations by regular principles of the transmutation of sounds; the necessity of finding an adequate explanation for the combination of ideographic and phonetic writing in the Assyrian texts; the lack of any key to the meaning of some words, particularly proper names, in the text discussed, if we are to be limited to Shemitic roots;—that these facts, and such as these, deprive the negative theory of any sufficient foundation.

Much study has of late been bestowed on this pre-Shemitic language. That it probably does not belong to the Ural-Altaic family, as many have supposed, has been stated already. We have noticed also—and this is the second point of special interest—its separation into dialects. There may have been several of these, but according to our present knowledge two were chief. The existence of these was first noted by Prof. Sayce in 1874, later by Lenormant and Pinches; but the recognition of the full importance of the discovery, and the detailed proof of the fact, are due to Paul Haupt, now of Göttingen. It will be convenient to distinguish these as "the main language" and "the dialect." There are some external differences, such as the form of some characters, the presence in the dialect of engraved lines between the rows of characters, and the much greater frequency in it of phonetic writing. The material variations of the dialect are chiefly in transmutation of sounds, *g*, *sh*, *u*, etc. of the main language appearing repeatedly as *m* or *b*, *n*, *ê*, etc. in the dialect. It is believed by Haupt and others that the dialect is, on the whole, older than the main language; it is proposed to call the main language Accadian, and the dialect Shumirian, but this has met with some opposition. The grounds for the naming have indeed not been thoroughly sifted as yet, and if we call the main language Accadian, this must be taken provisionally. The Assyrian scholars termed the dialect *êmê sal*, "feminine" or "female" language. Of this, several explanations have been suggested, none of which can claim to be absolute and final. Prof. Sayce thinks the Accadians took their wives from those who spoke the dialect, and hence the name. Haupt thinks that since *ê* was used sometimes, in the main language, to form feminine words, the preference of the dialect for *ê* (see above) may have led the Assyrians to call it the "feminine" language. He points out, as another possibility, that the older, dialectic forms maintained themselves longer in the mouths of the women, who were not so much exposed to foreign, modifying influences as the men. But all this must be matter for future discussion.

The chief characteristics of the Accadian language, according to Haupt, may be concisely mentioned. It makes use of fourteen consonants—*k*, *g*, *gh*, *t*, *d*, *s*, *sh*, *z*, *r*, *l*, *n*, *p*, *b*, *v* or *m*. It has four vowels—*a*, *i*, *u*, *ê*. There seem to be no diphthongs. The syllable begins with any vowel or consonant, and ends with any except *k*, *t*, *p*, and *s*. Euphonic changes of vowels and consonants take place to a limited extent. Primitive roots are monosyllabic. The language is agglutinative, forming new words by loose prefixes and affixes. When these are inflectional, they are under certain circumstances connected not with a noun, but with its modifying adjective. The formation of nouns and verbs follows definite laws—nouns almost always by prefixes, either one of the four vowels or the syllables *nin* (dial. *am*), *ki*, *nam*, each with a particular force. The only suffix for the formation of nouns is *gal*. Verbs are formed by prefixing *da*, *ta*, *ra*, and *sh*, or by adding *da*. Reduplication is also employed in verbs, adjectives, and nouns to strengthen the meaning in special ways. The noun need not have any mark of gender, number, or case, though it may sometimes have all three. Numbers are two, singular and plural. Various case-relations may be denoted by *postpositions* (instead of prepositions). The verb was originally a substantive with possessive suffix. Later, it was inflected by personal prefixes. A pronoun, used as object of the verb, stands between the personal prefix and the verb-stem. The tenses are present and imperfect. A precative and an imperative are distinguished. The negative (*nu*) is always prefixed. (The most important work on the subject of the Accadian and its dialect is *Die Accadischen u. Sumerischen Keilschrifttexte*, by Haupt, in 5 parts; Parts I.–IV., Leipzig, 1881–82.)

Under the head of trade it is needful only to point out that the business-system known to us from the contract-tablets of the later Babylonian and the Persian period existed many hundred years earlier. Great numbers of tablets from Erech, believed to be not later than the twelfth century B. C., and inscribed in the Accadian language, have recently been copied, and some translated. The form appears to be stereotyped. First comes the subject of contract, house, garden, etc.; then the names of the parties; then the conditions, etc., accompanied generally with a solemn oath; then the names of witnesses; then the date. The tablets bear also the seals of the contracting parties and the witnesses. (See Strassmaier, *Verhandlungen d. 5ten internationalen Orientalisten-Congresses*, Zweiter Theil, p. 320.)

Religion and Mythology.—From a mass of details only two or three points will here be noticed. The conception formed by the Babylonians of one of their chief gods is indicated by the figure of Shamash, the Sun-god, engraved on the archive-tablet found by Rassam in the temple at Sippara. Shamash is represented, we are told, with a long, flowing beard, sitting upon a splendid throne, attended by cherubim, with a ring, the symbol of eternity, in his hand.

A strong argument has been made out for the identification of the cherubim with the winged bulls of Assyria. It is shown that there is a general likeness between Ezekiel's description and the winged bulls; that the functions of both, in guarding the approach to the deity and supporting his throne, are the same; and that the common name for the winged bulls, *sêdu*, has a synonym in Assyrian, *kirûbu*. A list of Assyrian synonyms gives *karubu* the meaning "majestic." If, as is probable, *kirûbu*, *$k^{e}rub$*, are from this root, then the cherubim are the "majestic ones."

We can only hint at the prospect of light from future discoveries on the eschatological beliefs of the Assyrians. M. Clermont-Ganneau published in the *Revue archéologique* (Dec., 1879) a representation of Gula, "who makes the dead alive," sailing the waters of the river of death in her sacred boat. She appears to be formed from parts of various animals, and holds serpents (emblems of life?) in her hands.

On the whole, however, investigations in the department of Babylonian-Assyrian mythology and religion are still in their infancy, and we must here await new discoveries and more prolonged and patient thought. (F. B.)

BACHMAN, John, D. D., LL.D. (1790–1874), an American naturalist, was born in Dutchess co., N. Y., Feb. 4, 1790. He was licensed to preach in 1813, and became pastor of the German Lutheran church in Charleston, S. C., in 1815, which post he held until his death, Feb. 24, 1874. He was an associate of Audubon, the ornithologist, whom he assisted in the preparation of his great work on *The Birds of America* and also on *The Quadrupeds of North America* (6 vols., 1846–50), of which he was the principal author, though it was illustrated by Audubon and his sons. Among his other works are—*Defence of Luther and the Reformation* (Charleston, 1853); *Design and Duties of the Christian*

Ministry (1848); *The Doctrine of the Unity of the Human Race exemplified on the Principles of Science* (1850; 3d ed. 1876); *Notice of Nott and Gliddon's Types of Mankind* (1854); *Characteristics of Genera and Species as applicable to the Doctrine of the Unity of the Human Race* (1854); *Catalogue of Phænogamous Plants and Ferns growing in the Vicinity of Charleston, S. C.*

BACKUS, Isaac (1724–1806), an eminent Baptist minister, was born at Norwich, Conn., Jan. 9, 1724. In 1745, during the great New England revival, he withdrew from the Congregational Church, and with some friends held "separate" religious meetings. The next year he began to preach, and in 1748 was ordained pastor of a "Separate" church at Middleborough, Mass. The question of baptism was greatly agitated in his congregation, and in 1751 he was baptized by immersion. In 1756 those members of his congregation who had become Baptists were organized into a church, and he was installed as their pastor. In 1772 he was chosen agent for the Baptist churches of Massachusetts to secure for them exemption from burdens imposed by the laws of the colony, and two years later appeared before the Congress at Philadelphia for a similar purpose. He was an earnest advocate of the entire separation of Church and State, and was influential in forming public opinion on this question. In 1789 he went on a missionary journey as far as North Carolina. He died Nov. 20, 1806. He published many sermons and some controversial treatises and pleas for religious liberty, but his greatest work is a *History of the Baptists* (3 vols., 1777, 1783, 1796). Its preparation required great diligence and patience in the investigation of the original records of the towns of New England, and Bancroft bears testimony to its accuracy and impartiality. A new edition was published in 1871 by the Backus Historical Society.

BACON, Leonard, D. D., LL.D. (1802–1881), an eminent American divine, was born at Detroit, Mich., Feb. 19, 1802, the son of a missionary to the Indians. He graduated at Yale College in 1820, and studied theology at Andover. He was pastor of the First Congregational Church at New Haven 1825–66, was acting professor of systematic theology in the Yale Divinity School 1866–71, and lecturer on church polity and American church history 1871–81. Dr. Bacon was an able and influential speaker and a ready and prolific writer. He took an early stand in favor of the abolition of slavery, but was as conspicuous in his opposition to the extremists of the Abolition party as in his hostility to slavery itself. He took part in the movement which led to the formation of the New School Presbyterian Church, and afterwards in the negotiations for reuniting the Old and the New School branches of the Presbyterian Church (1869). He was one of the founders and first editors of *The Independent* and of *The New Englander*. Among his works are a *Life of Baxter* (1830); *Thirteen Historical Discourses* (1839); *Essays on Slavery* (1846), a work of rare ability; *Christian Self-Culture* (1863); *Genesis of the New England Churches* (1874), etc. He died at New Haven, Conn., Dec. 24, 1881.

BACON, Leonard Woolsey, D. D., son of the preceding, a Congregational minister, was born in New Haven, Conn., Jan. 1, 1830. He graduated at Yale College in 1850, and studied theology at Andover and Yale. He also studied medicine and received the degree of M. D. at Yale Medical School in 1855. He has been pastor of churches in Rochester, N. Y., Litchfield, Conn., Stamford, Conn., Brooklyn, Baltimore, Pittsburg, and Norwich, Conn. He also for a time had charge of an American congregation in Geneva, Switzerland. He received the degree of D. D. from Yale College in 1879. He has published *Congregational Hymn and Tune Book* (1857); *The Book of Worship* (1865); *Church Papers* (1876); *A Life worth Living* (1878); *The Sunday Question* (1882); *The Church Books* (1883). He is also author of a large number of pamphlets and of articles on historical, moral, and religious topics in magazines and reviews.

BACTERIA (*βακτήριον*, a little rod), or the Schizomycetes, are among the simplest, most minute, and lowest living forms known. They are classed under the vegetable kingdom, and belong to the Protophytes. They are devoid of chlorophyll, and on account of the resistance they offer to the action of alkaline solutions and of acids they are supposed to have a limiting membrane (Ziegler, *General Path. Anat.*, 1883, p. 262).

The classification generally accepted is that of Cohn—a classification based upon what is known of the morphology of the organisms in question:

1. The *Sphærobacteria*, or micrococci: globe-shaped bacteria, of which there are three recognized species—namely, the *Micrococcus chromogenes*, or pigment micrococcus; *M. zymogenes*, or ferment micrococcus; and *M. pathogenes*, or disease micrococcus.

2. *Microbacteria*, bacteria proper: organisms which resemble short straight rods. Two species are known—*Bacterium termo* and *B. lineola*.

3. *Desmobacteria*. According to Cohn, there are two forms, the one straight and called *Bacillus*, and the other wavy, called *Vibrio*.

4. *Spirobacteria*, twisted or spiral. There are two genera, *Spirillum* and *Spirochæta*.

General Peculiarities.—All bacteria are unicellular and have cilia (Magnin, *Bacteria*, 1880, pp. 39, 35), and a cellulose membrane which gives the characteristic blue color with iodine. They vary in size, the smallest being the sphærobacteria, which "under the microscope appear as bright round or ovoid spherules of scarcely measurable size" (Ziegler, *Patholog. Anatom.*, 1883, p. 263); the largest are of the genus *Spirillum* (Magnin, *l. c.*, p. 30), and measure about $\frac{2}{10}$ millimetre in length. Cohn (*Bacteria*, transl. by Dolley, 1881, p. 8) says: "These smallest bacteria may be compared with a man about as a grain of sand to Mont Blanc." On account of their diversity in size, Billroth makes a classification into micro-, meso-, and mega-bacteria.

The weight of a bacterium (Ziegler, *l. c.*, p. 276), according to Naegeli, is about the one ten-thousand-millionth of a milligram. Chemically, bacteria are composed of an albuminoid substance called mycoprotein, with distinct traces of cellulose and shining granules supposed to be crystalline sulphur. In respect to distribution, they are found almost everywhere except in the purest spring-water, and rain-water which falls at the end of a long shower. They are also absent from metals, oils, and acids. The number of bacteria present in any substance depends largely upon the amount of nourishment suited to them; but there are certain other conditions necessary to their existence. Among these conditions are the presence of oxygen, a suitable temperature, the presence of nutritive material, and the absence of substances poisonous to bacteria (like corrosive sublimate, iodine, etc.). The effect of changes of temperature varies with the kind of bacterium. At a temperature of 113° to 122° Fahr. the *Bacillus* still multiplies, while the *Bacterium termo* dies. The most favorable temperature for bacteria to develop is about 35° C. (95° Fahr.). At a temperature of 5° C. (41° Fahr.) all development ceases. Bacilli die when boiled for two hours in water; and superheated steam at 105° C. (221° Fahr.) will kill in ten minutes any bacteria exposed to its action. The spores are, however, more resistant, and can endure extremes of temperature which would destroy the developed plant. In dry seasons the soil contains more bacilli, in wet seasons more micrococci.

For the food or nutritive matters upon which bacteria can subsist, carbon, nitrogen, oxygen, and certain salts are requisite. Water must also be present.

Certain substances act as poisons to these low organisms, or at least react upon them in such a way as to prevent their development. Corrosive sublimate in aqueous solution (1 : 20,000) kills spores of bacilli in ten minutes. Koch states that a solution of 1 : 300,000 arrests the germination of the spores. Carbolic acid, 5 per cent. solution, kills the *Bacillus anthracis* in twenty-four hours. Bacilli cease development in solution of iodine 1 : 5000, and in solution of bromine 1 : 1500.

Bacteria multiply by fission and by the formation of spores and sporangia. The process of reproduction by fission consists of an increase in size longitudinally and a transverse subdivision into cells. According to Cohn (*l. c.*, p. 11), one bacterium under proper conditions may divide and subdivide, so that after twenty-four hours it will have multiplied to the number of 16,777,200, and at the end of a week to a number expressed by fifty-two figures. Bacteria exist either in a state of rest or motion. The motion is thus described by Cohn (quoted after Magnin, *l. c.*, p. 33): "The bacteria advance, swimming, then retreat without turning about, or even describe circular lines. At one time they advance with the rapidity of an arrow, at others they turn upon themselves like a top; sometimes they remain motionless for a long time, and then dart off like a flash." Some authorities (Ehrenberg) attribute the motion to the cilia, others (Cohn) to favorable degrees of temperature, plenty of nutrition, oxygen, etc.

Methods of Cultivation.—In studying the life-history of bacteria, their relation to disease, etc., they are cultivated artificially in so-called "culture-cells," of which there are two varieties, the wet and dry. In carrying on wet "cultures" different fluid media are used, depending in a great measure upon the kind of bacteria to be studied. Some kinds develop better in blood-serum, others in bouillon, others in chicken-broth, etc. Before the "cultures" are commenced the fluid is sterilized, or rendered free from all bacterial germs, by raising it to a high temperature. Thus, according to Pasteur and Tonssaint (*Comptes Rendus*, Nos. 6, 17, 18, 1880), the micrococcus that causes fowl-cholera can be cultivated in alkalized chicken-broth, the broth being previously sterilized by raising it to the temperature of 115° C. (239° Fahr.). Several so-called "culture-fluids" have been introduced. One used by Pasteur is as follows (Magnin, *l. c.*, p. 112): distilled water, 100; sugar candy, 10; tartrate of ammonia, 1; ashes of one gramme of yeast, 0·075. Another proposed by Cohn is—distilled water, 100; tartrate of ammonia, 1; ashes of yeast, 1. In the dry "culture" some solid medium is used, such as gelatine slightly alkalized and containing small quantities of peptone, serum of blood, etc. In either of these "cultures" the bacteria can be "purely" cultivated by making many generations—*i. e.*, taking a minute quantity from the original sterilized "culture" and adding it to a second culture-cell; then after a time taking a minute quantity from this "culture," and adding it to a third cell, and so on indefinitely. In carrying on these "cultures" close attention must be paid to the temperature and to the other conditions necessary to the life and development of bacteria.

Relation to Fermentation.—Vinegar is the result of *acetic acid fermentation*, a process which is due to the presence of a protophyte called *Mycoderma aceti*, and classed under the head of microbacteria. There develops upon the surface of the liquid a fine "velvety veil," called *mother of vinegar*, which consists essentially of an aggregation of minute plants of this species. During the process the alcohol becomes oxidized and gives rise to the formation of acetic acid and water. The formula is as follows: $C_2H_6O + O_2 = C_2H_4O_2 + H_2O$. When milk turns sour, *lactic acid fermentation* has been going on, which consists in the conversion of milk-sugar into lactic acid. This process is due to the presence of the *Vibrio lactis* (Pasteur). The lactic acid hardens and separates the caseine, which takes a semi-liquid form and becomes a coagulum or clot containing much water, etc. When milk is cooked the bacteria are destroyed, and if new germs are kept out the milk may be preserved through an indefinite time. This same bacterium plays an active part in the production of sauerkraut. A further development of the lactic acid into butyric acid by the process of *butyric fermentation* is caused by a kind of bacteria "allied to *Bacillus subtilis*" (Magnin, *l. c.*, p. 145). This kind of fermentation takes place in the production of rancid butter. In the fermentation of urine the urea is converted into carbonate of ammonia through the agency of the *Micrococcus ureæ* (Cohn). What is called *viscous fermentation* consists of a change which sometimes takes place in wines, and is also due to bacteria. A certain bacillus called *Dispora caucasica*, when present in milk, causes a peculiar fermentation essential to the production of *koumiss*, a drink much prized in the Caucasus. Especially peculiar is that species of sphærobacterium called *Micrococcus chromogenes* (Cohn), which by a ferment process produces various coloring-matters. When on bread it forms a blood-red color and is called *Micrococcus prodigiosus*. In olden times it was supposed to be blood, and its presence on bread was regarded as a very significant omen. On hard-boiled egg it assumes a yellow color, and is called *Micrococcus luteus*. When pus in an open wound assumes a bluish tint, this fact is due to the presence of *Micrococcus cyaneus*. The litmus of the chemist is obtained from certain lichens by a process of fermentation in which the presence of bacteria is essential.

Relation to Putrefaction.—Bacteria are necessary factors in the process of putrefaction, and the degree of change depends upon the number of these low organisms present. The process is essentially chemical, but it cannot go on without bacteria. If they are kept away or destroyed, all putrefactive change is prevented. The species mostly associated with the process is *Bacterium termo*, also called *the rod bacterium of putrefaction*. The principle underlying the preservation of fruits, meats, etc. in air-tight cans consists, first, in the destruction, by boiling, of the bacteria present, and, second, in the prevention of others from gaining access. This is accomplished by sealing up the material to be preserved in glass or metal vessels. Ice acts as a preservative by keeping the temperature at a degree which is unfavorable to the development of bacteria.

The further relation of bacteria to putrefaction is thus aptly described by Duclaux (quoted after Magnin, *l. c.*, p. 151): "Without them organic matter, even when exposed to the air, would not be destroyed or would be transformed with extreme slowness, in consequence of a slow combustion produced by oxygen. With them, on the contrary, its destruction takes a rapid march and becomes complete. If, then, the equilibrium is maintained between living nature and dead nature, if the air has always the same composition, if the waters are always equally fertilizing, this fact is due to the infinitely minute agents which effect the processes of fermentation and putrefaction."

Relations to Disease.—The theory that diseases, especially those of contagious or infectious nature, are caused by low forms of life is very old, and finds expression in the writings of ancient medical observers. The character of this class of diseases, their mode of development, their occurrence in epidemics, and the very idea of a contagion, point strongly to a parasitic origin, or what is technically termed a *contagium animatum*. The theory received great support in the discovery that many diseases of plants and animals are caused by low organisms. The first important fact, however, in connection with the relation of bacteria to disease was discovered by Pollender in 1849. This observer discovered certain rodlets in the blood of animals sick with splenic fever. These rodlets were first pointed out as the specific virus of this disease by Davaine. It was not, however, until after the extensive researches of Koch that the life-history of this bacterium, known as *Bacillus anthracis*, became known.

Bacteria gain access to the human body by means of food that is swallowed, and also by inhalation. Thus, the alimentary canal at all times swarms with them.

Through a solution of continuity in the skin or mucous membrane they find their way into the tissues, and, meeting with the proper conditions, begin to develop. They may travel along the lymphatics, and finally through the thoracic duct, to the blood-vessels. Some authorities assert that certain kinds of bacteria (*micrococcus of erysipelas*) flourish best in the lymphatics, and others (*Bacillus anthracis*) in the blood. Certain kinds (*Bacillus anthracis*) are said to develop in flowing blood, while others (*Bacillus tuberculosis*) develop in a state of rest. Once in the circulation, they may be carried to all parts of the body and excite inflammatory changes in different organs. In the blood-vessels they may cause thrombosis, and by their action on the walls of the vessels give rise to hæmorrhage. The extent of the injury depends upon the kind and number of bacteria present, and upon other conditions favorable or unfavorable. The kind most frequently found in connection with infectious disease are the sphærobacteria or micrococci. They are found in pyæmia, septicæmia, puerperal peritonitis, erysipelas, scarlet fever, diphtheria, measles, small-pox, vaccinia, ulcerative endocarditis, gonorrhœa, purulent inflammations, etc., etc. The name of the bacterium is generally the same as the disease with which it is associated; thus, *Micrococcus diphtheriticus*, *erysipelatis*, *septicus*, etc., etc. Whether the bacteria present in the diseases mentioned above act as the cause is not yet determined. For anthrax (splenic fever, malignant pustule, charbon, woolsorter's disease) the desmobacterium *Bacillus anthracis* is recognized as the cause. This bacterium can be cultivated artificially, and upon its inoculation in lower animals or man the disease always follows. The disease as occurring in man is characterized by the appearance of papules, vesicles, and pustules in the skin, and, later, often by intestinal lesions. Upon examination all the lesions are found full of the characteristic bacteria. Koch asserts that when animals have died of this disease, and are not buried deeply enough, the spores may reach the surface and infect other animals that happen to be upon the spot. Klebs and Tommasi Crudeli, experimenting with the malarial atmosphere of the marshes about Rome, claim to have succeeded in isolating a bacterium called *Bacillus malariæ*, which is regarded by them as the same form which is found in the blood of patients suffering with malarial disease.

In the lesions of leprosy, bacilli were first discovered by Neisser in 1879, who claims to have produced leprosy on lower animals by inoculation with the *Bacillus lepræ*. They are found in all leprous nodules.

The *Bacillus tuberculosis* was discovered by Dr. Robert Koch of Berlin, March 24, 1882, and it is asserted to be the exciting cause of tuberculosis. The length is about one-third the diameter of a red blood-corpuscle, and in width the plants are about one-sixth their length. Koch states that the tubercle-bacilli are always present in tubercles, and often in the sputum of tuberculous patients, that they can be cultivated in sterilized blood-gelatin, and that animals inoculated with the product of these "cultures" become tuberculous, and in the tubercles the characteristic bacilli can be found; furthermore, they are found in the tubercles of tuberculous monkeys and chickens and in the lesions of "pearly disease" of cattle; from which facts Koch concludes that these diseases are identical with tuberculosis as occurring in man. The tubercle-bacilli can be cultivated in dry "cultures" consisting of serum of ox-blood. They only develop at a temperature of between 30° and 40° C. (86° and 104° Fahr.), and multiply very slowly, after ten days becoming visible in a "culture" to the naked eye in the form of dry white scales, which after three or four weeks reach the size of a poppy-seed. They are detected by submitting tuberculous sputum or sections of tubercles to certain processes of staining. The method adopted by Koch is as follows: Sections of tubercle (if the specimen be sputum it is allowed to dry on a cover-glass) are placed for twenty-four hours in a mixture composed of 200 c.cm. of distilled water, 1 c.cm. of a concentrated alcoholic solution of methylene blue, and 0·2 c.cm. of a 10-per cent. solution of caustic potash. After twenty-four hours the specimens are washed with distilled water, then with a solution of vesuvin, and then again with water, and finally mounted in Canada balsam. On examination with a magnifying power of 250 to 300 diameters the characteristic bacilli appear as blue-stained rodlets on a brown background. The method proposed by Ehrlich is simpler, inasmuch as specimens of tubercle-bacilli in sputum can be prepared in less than a half hour. Sputum from a tuberculous patient is pressed between two cover-glasses. The glasses are then drawn apart, and passed slowly through the flame of a Bunsen burner. They are then allowed to remain about fifteen minutes in an alcoholic solution of methylene blue to which an emulsion of aniline oil and water, filtered, has been added drop by drop until opalescence appears on the surface. They are then treated with a 33⅓-per cent. dilution of nitric acid for a few seconds, washed with distilled water, and placed in a solution of vesuvin for two or three minutes; then mounted in balsam. The nitric acid decolorizes everything but the bacilli, which retain their blue color even after being placed in the solution of vesuvin that stains brown all other parts of the specimen. Another quick method is that proposed by Gibbes (*Brit. Med. Journ.*, Oct. 14, 1882). The action of this bacillus is supposed to be as an irritant. Gaining access to the circulation and deeper structures of the body, and finding conditions favorable for its development, it is supposed to excite an inflammation which results in the formation of collections of cells called "tubercles" (Ziegler, *l. c.*, p. 177).

The *Spirochæta* (or *Spirillum*) *Obermeyeri* was discovered in the blood of patients suffering from relapsing fever by Otto Obermeyer in Berlin in 1873. It has the same form, size, and kind of movements as *Spirochæta plicatalis*, discovered in the mucous membrane of the mouth and nose by Cohn. It is found only during the febrile paroxysms. When examined in a drop of blood taken from a patient, it exhibits a very lively movement, not unlike that of spermatozoa. Its movements are sometimes so rapid as to cause difficulty in its detection. Its length varies from one and a half to six times the diameter of a red blood-corpuscle, or from ten to forty micro-millimetres. Of its history outside the human body nothing is known. It develops, as far as known, only in the blood, and when there present multiplies rapidly. It is regarded by authorities as the cause of relapsing fever. There is one case on record where the disease was transmitted to a monkey by inoculation with the *Spirochæta* (*Deutsche Med. Woch.*, 16, 1879; *London Lancet*, 1, 1880).

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See Vol. III. p. 196 Am. ed. (p. 227 Edin. ed.).

BADGER, AMERICAN, a carnivorous quadruped of the family *Mustelidæ*, sub-family *Melinæ*—the *Taxidea Americana*. The badgers form a special group of *Mustelidæ* (*Melinæ*), related to the skunks on the one hand, to the otters on the other. They inhabit Europe, Asia, and America. There are four leading genera: the Asiatic *Mydaus* and *Arctonyx*, the European *Meles*, and the American *Taxidea*, the subject of the present article. The last named, long confounded with *Meles*, offers the following very distinctive generic characters:

Dental formula $i.\ \frac{3-3}{3-3};\ c.\ \frac{1-1}{1-1};\ pm.\ \frac{3-3}{3-3};\ m.\ \frac{1-1}{2-2} = \frac{16}{18} = 34$. Upper molar a right-angled triangle, with hypothenuse postero-external. Back upper premolar similar in size and shape, but the hypothenuse postero-internal. Back lower molar with two tubercles. Front lower molar comparatively small, not dilated behind, mostly opposing the back upper premolar (instead of the upper molar, as in *Meles*). Cerebral portion of skull depressed-cuneiform, very wide across the flaring occipital crest; inter-mastoid diameter nearly equalling the inter-zygomatic; sides of the brain-case straightened and strongly convergent anteriorly. Bony palate reaching half-way to ends of pterygoids. Bullæ auditoriæ highly inflated, impinging upon the paroccipitals. Condyles of jaw often locked in the glenoid. Coronoid of jaw erect, pointed, its posterior edge angulated. Animal with the body extremely stout, squat, and clumsy, owing to great depression; tail short, broad, flattened; pelage loose; coloration diffuse; fore claws enlarged, fossorial. Confined to North and Middle America.

There is but a single species of the genus, represented, however, by two geographical races, *T. Americana* and *T. Berlandieri*. The former inhabits the United States from Wisconsin, Iowa, and Texas westward, and British America east to Hudson's Bay, north to 58° at least. In the United States it formerly extended eastward to Michigan, Illinois, Indiana, and even Ohio, but has been extinct in the latter since about 1860. It is replaced near the Mexican border by var. *Berlandieri*, which extends into Mexico. The general color is grizzled gray, produced by a blending of gray, black, white, and tawny; the top of the head darkest, divided by a white stripe; below, uniform whitish, shaded or not with gray or tawny; limbs blackish; a dark patch before the ear. Length about two feet from nose to root of tail; tail six inches; head five and one-half. Var. *Berlandieri* chiefly differs in more rufous coloration and extension of the white stripe along the upper parts.

The perinæal region shows, as in other badgers, immediately beneath the root of the tail, a large transverse fissure leading into the peculiar subcaudal pouch of *Melinæ*, and in advance of this a large protuberance, more or less naked, and divided by a median raphé. These indicate the glands with which all *Mustelidæ* are provided, like those which in the skunks reach their acme of development, and the secretion of which is excessively offensive. The penis-bone is about four inches long, clubbed at one end, the other bent nearly at a right angle.

Now mostly retired west of the Mississippi, the badger is in some portions of the West among the most abundant of the Carnivora, not excepting even the coyoté (*Canis latrans*). I have found them in countless numbers nearly throughout the region of the Upper Missouri and its tributaries: their burrows are everywhere, with those of coyotés, kit-foxes (*Vulpes velox*), prairie-dogs (*Cynomys ludovicianus*), and various spermophiles (*Spermophilus*); being so numerous as to be a constant source of danger to horsemen. In the buffalo country, particularly, badgers are extraordinarily abundant, being attracted and retained by the surety of abundant food-supply; and there are regions where the chase of the buffalo is extremely dangerous. The badger-burrows are known from those of the prairie-dog and other spermophiles by their superior dimensions; besides which they differ in not being built up in a regular mound; but they cannot be distinguished from those of coyotés and kit-foxes. But it must not be supposed that the innumerable badger-diggings are the residences of these animals. Too slow to capture the nimble rodents upon which it largely subsists, the badger seeks them in their own retreats; and it is a matter of a few minutes for this miner to enlarge their holes and enter them.

The badger is one of the most secretive animals of this country—one whose whole mode of life tends to screen it from ordinary observation so thoroughly that some of the most important points in its vital economy remain to be determined. As will have been gathered from what has preceded, it lives altogether in holes in the ground, for the excavation of which its structure is perfectly adapted. In cold latitudes it hibernates during a portion of the year. The abundance of badgers in unsettled portions of the country might be expected, seeing how few are their effective enemies. The animals are able to stand off wolves and foxes, and seldom venture far from their secure retreats. Man, as usual, is their most formidable enemy, annually destroying thousands for his convenience or luxury. The flesh is scarcely edible, owing to its rankness, but the pelage yields a valuable and at times fashionable fur, used for robes and for muffs, tippets, and trimmings. Thousands of shaving-brushes are said to be made annually from the long hairs, which are also extensively used in the manufacture of artists' materials. (E. C.)

BADGER, GEORGE PERCY, D. C. L., an English clergyman and Orientalist, was born at Chelmsford, Essex, in 1815. Spending his youth in Malta, he became familiar with the peculiar dialect of that island. In 1835 he went to Syria, and for nearly two years was associated with the American Mission Press at Beirût, enjoying the friendship of Rev. Dr. Eli Smith and Rev. Dr. William Thomson. He made several excursions through Syria and Palestine, visited the Euphrates Expedition, then at Birejik under Col. Chesney. Returning to Malta, he was employed in the editorial department of the Church Missionary Society, and was associated with Ahmad Fâris Efendi, the eminent Arabic scholar. Mr. Badger published several text-books and treatises on education, as well as a description of Malta which has passed through several editions. He returned to England in 1840, and was ordained in the next year. He was then sent on a special mission to the Nestorians of Khurdistân, and on his return from a second visit published a valuable work on *The Nestorians and their Rituals* (1852). His discovery of a cuneiform tablet at Nimrûd on his first visit eventually led to the subsequent excavations there by Layard. Mr. Badger was next appointed a chaplain in Bombay, and after spending a year in the Mahratta country was stationed at Aden. In this place he rendered important services to Sir James Outram. In the Persian Expedition in 1857, Sir James again availed himself of Mr. Badger's services. On other occasions Mr. Badger's acquaintance with Oriental languages, character, and habits was brought into requisition by the British Government. In 1862 he returned to England and devoted himself chiefly to literary pursuits. In 1872 he accompanied Sir Bartle Frere in his mission to Zanzibar. In 1873, Mr. Badger received the degree of D.C.L. from the archbishop of Canterbury, and was made a knight of the Crown of Italy. The latter honor was in acknowledgment of his annotated edition of the *Travels of Ludovico di Varthema*. His works have related chiefly to Eastern topics. Among these is a *History of the Imâms and Seyyids of Omân* (1871). His *English-Arabic Lexicon* (1881), a 4to volume of 1250 pages, is the result of forty years' labor.

"Bad Lands," in Western States and Territories.

BAD LANDS form a peculiar type of the desert regions in the north-west of the United States. They became known to the early Canadian French trappers and fur-traders, and were by them called *mauvaises terres*, of which "bad lands" is a literal translation. In the Sioux language its name is "Ma-koó-si-tcha," meaning a country which is very difficult to travel through, not only from the ruggedness of the surface, but also from the absence of any good water and the small supply of wood and game (*Hayden*). The portion of "bad lands" which has attracted attention first appears in the south-western corner of Dakota Territory as the south-eastern flank or approach to the Black Hills, and is best designated as the "White Earth River Bad Lands." The White River receives the entire drainage of these Bad Lands, while the Cheyenne River through its north and south forks drains the Black Hills. It is to the west of the Black Hills, however, between them and Big Horn range, and again west, between the latter and the Wind River range, and again south-west of the Wind River and Laramie ranges, that the Bad Lands gain their greatest extension. The two latter mountain-chains constitute at this latitude the main chain of the Rocky Mountains, while the Big Horn Mountains and the Black Hills appear as two formidable outlying forts defending the approaches. All this region lies within Wyoming Territory, but the Pacific water-shed also contains its share of bad lands, along the Wahsatch Mountains in Utah and Idaho, and again they push into the southern part of Montana. In fact, they reappear in patches through Arizona, Nevada, and Eastern Oregon, and even in California. Altogether, they occupy an area of 1,000,000 square miles, approximately. But of this immense surface the Bad Lands proper, in their typical development, comprise not more than one-tenth, though in Wyoming they cover about one-third of the surface.

Topography.—We have defined these Bad Lands as a peculiar type of desert, and shall now show wherein this peculiarity consists. Says Hayden (*U. S. Geolog. Survey Report*, 1870): "In the summer the sun pours its rays on the bare white walls, which reflect them upon the weary traveller with double intensity, not only oppressing him with the heat, but so dazzling his eyes that he is not unfrequently affected with temporary blindness. I have spent many days exploring this region when the thermometer was at 112° in the shade, and there was no water suitable for drinking purposes within fifteen miles. It is only to the geologist that this place can have any permanent attractions. He can wind his way through the wonderful cañons among some of the grandest ruins in the world. Indeed, it resembles a gigantic city abandoned and fallen to decay; domes, towers, minarets, and spires may be seen on every side, which assume a great variety of shapes when viewed from a distance. Not unfrequently the rising or the setting sun will light up these grand old ruins with a wild, strange beauty, reminding one of a city illuminated in the night when seen from some high point. The harder layers of rock project from the side of the valley or cañon with such regularity that they look like seats, one above the other, of some vast amphitheatre." It is a jumble of rocky masses wearing gradually away into the sands which winds and torrents of rain carry out upon the plains, where their shifting masses often have overwhelmed whole trains of immigrants, burying men and animals. Yet the present appearance is merely temporary in a geologic sense, in which a thousand years are as a day. Other parts of the American desert appear as "alkali-flats," others as rolling plain, and still others as moving sand-hills. They are all desert—*i. e.*, uninhabitable for want of water, and as a consequence absence of vegetation, except a few plant-species, like the sage-bush and *Cactus opuntia*, which do not thrive in well-watered ground. The peculiarity of the Bad Lands proper lies, therefore, in the broken condition of their topography.

Geology.—The steeply-rising walls of these architectural hills reveal a structure of nearly horizontal or slightly dipping rock-bed. Only where they overlap the foot of the mountains, as in the Black Hills, the Wind River, and Wahsatch Mountains, is there sometimes a steeper dip observable, falling away from the mountains. The beds are made up of coarse and fine sandstone, very hard or very soft, of indurated clays, of calcareous clays or marls, and of peculiar purely-white sandy deposits. These are composed of microscopic unicellular algæ, called diatoms. The fascination arising from the landscape is very largely due to the contrast of the alternating, and generally very brilliant, colors of these various rocks. Starting at the head of any of the feeders of the south fork of the Cheyenne River, for instance, the explorer finds himself at an altitude of 10,000 feet upon granite, or rocks very similar, which are known all over the world to constitute the lowermost rock-formation—the Archæan, Eozoic, or Laurentian rock-system. In the natural course of things we should find the youngest formations at the highest points; and so it is wherever the earth has been undisturbed. But all of our present mountains owe their existence to an upheaval or corrugation of the surface, the reason of which in many cases cannot be ascertained; and thus the oldest rocks, which also offer most resistance to weathering, are found at the top, constituting the heart, centre, or backbone of the mountains. Now, following the water-course downward, we observe the entire succession of geologic formations: Silurian, Devonian, Carboniferous, Triassic, Jurassic, Cretaceous, the strata of the latter being very much dislocated and upturned. Upon these we find the lowest beds of the Bad Lands in horizontal position, as observed. They form at this place the youngest geological formation, and by conclusive evidence must be referred to the great groups of Tertiary deposits. This evidence is furnished by the fossil remains of animals and plants. The terraced pyramids of the Bad Lands enclose and preserve for future ages the records of their creation. Some of the marl-beds are so filled with skeletons and bone fragments that they are most aptly called a "geological cemetery." In the very lowest bed, at the foot of those apparent ruins, were found by Dr. Hayden and identified by Dr. Joseph Leidy the jaws and teeth of a hippopotamus resembling the river-horses of Asia and Africa; with it the bones of *Titanotherium*, a huge pachyderm, being in fact a rhinoceros without a horn. Gradually, as the higher beds are examined, the remains of a great variety of land and fresh-water animals come to light. In a bed of flesh-colored marl, visible from a long distance like a broad band in the sides of these washed hills, thousands of turtles are imbedded. They vary in size from an inch to four feet across the back, and their hard parts are perfectly preserved in the soft marl, as if they had died only yesterday. They belong to a single species. With them are buried the bones of extinct genera of ruminating animals who possessed the combined characters of the deer and the hog, having four toes, incisor and canine teeth like the hog, but molar teeth like a deer; they had no antlers or horns. These animals furnished abundant food for carnivorous animals—foxes, wolves, *Hyænodon*, and the sabre-toothed tiger, *Drepanodon*, so called from the formidable length of its upper canine teeth or fangs. Dr. Leidy describes the *Hyænodon horridus* as an animal possessing the characters of the wolf, tiger, hyæna, weasel, raccoon and the opossum, forming the type of a family unlike any other, living or extinct. This species was probably the most sanguinary of terrestrial animals that ever existed; its full-grown size was about that of the largest black bear. It was rivalled in ferocity only by the *Drepanodon*, which grew to the size of a large African lion: two of the skulls found exhibit the marks of conflict with some equally rapacious animal, most probably the largest *Hyænodon*. Camels and buffaloes were represented in this region when these extinct Carnivora were rampant; but most interesting of all is the discovery of horse-like animals in the Bad Land bone-beds; for it is generally conceded that no horses existed upon the American continent when the European nations took possession, and that none had existed here during the present geological period. Yet here, in Wyoming, science reclaims from their rock-bound tombs the relics of a truly wonderful race of horses, showing that prior to the Glacial epoch America was the very home of the horse. Dr. Marsh shows conclusively, from his extensive collections made in Wyoming, Nebraska, and Oregon, that the earliest horse (*Orohippus*), possessing four well-developed toes, walked in preference on the middle toes—that in the next following stratum the skeletons show three toes, the fourth being a merely useless appendage (*Mesohippus*). Going higher in the rock-beds—those of later formation—the two side toes become shorter and thinner from disuse (*Miohippus* and *Protohippus*); and finally in the highest Tertiary rocks the *Pliohippus* shows the two side toes merely as splint-bones hidden under the skin, as in the present horse, the ass, and zebra. Nothing has ever been brought forward by science better adapted to demonstrate the harmonious process of development in the animal kingdom; and science owes this to the "Bad Lands."

Whilst thus palæontology has been, and is still, reaping a rich harvest, the direct needs of man are supplied by this barren land in the numerous beds of excellent brown coal extending over a large area, and showing remarkable thickness and regularity of occurrence. One of the thickest beds of excellent coal is exposed at Carbon Station, on the western slope of the Black Hills, or Laramie range, in Eastern Wyoming, only three hundred yards from the Union Pacific Railroad. The bed dips to the west 30° to 50°, and the coal is 7 to 9 feet thick, and is referred geologically by Dr. Hayden to the *Wahsatch group*, or lowest Eocene Tertiary. It furnishes fuel for the locomotives. Above the coal are layers composed almost entirely of deciduous leaves. Beneath the coal there are indurated clays and rocky strata, in which are found most perfect impressions of leaves by the thousand, much like those of the present forest trees—poplar, sycamore, linden, and many others—but belonging to species long since extinct (*Hayden*). Very different is this flora from that imbedded in the slate-bands of the Eastern coal-beds. Here only gigantic ferns and palms; there the homelier denizens of our present woods. The climatic conditions under which those trees grew cannot have been very different from those of the present temperate zone, and yet how immensely different the animal creation which roamed through those Tertiary forests!

The geological history of the Bad Land region is of singular interest, and is stated very clearly by Dr. Newberry (*U. S. Geolog. Survey*, 1870—F. V. Hayden). The deductions which this able geologist made from the then existing topographical and palæontological facts stand unaffected by the large additions gathered since. These have only helped to work out details of structure, increased the number of stratigraphical subdivisions into groups, and enriched palæontology. According to Dr. Newberry, the great Cretaceous sea had covered the whole of North America west of Kansas. The Sierra Nevada must have been a large, long-stretching island or peninsula rising from the ocean, for rocks of the Cretaceous age, indicated by the bones of strange reptiles, are only found a few hundred feet up against the flanks of this lofty range. The Coast Range of California did not then exist. Slowly the land rose; the ocean receded nearly to its present limits. But there was no drainage. The stupendous gorges of the Columbia River through the Cascade Mountains, of the Sacramento through the Sierra Nevada, and of the Klamath, had to be cut before such draining of the rainfall could be effected. Numerous lakes formed, into which trees and dead animals were carried with the mud of the rivers. All subsided together undisturbed. The lakes in time invaded the land more and more; they became connected, forming fresh-water basins to which our Great Lake system is but a poor rival. In the earliest lakes we must look for brackish water, because they were really remnants of the Cretaceous ocean, and the rock-strata deposited in them show therefore marine animals, oysters and similar shells, along with the skeletons of mammals. Then came most extensive volcanic activity, producing islands of lava, which now appear as low ranges—the so-called "Lost Mountains," rising from the alkali plains of Utah and Idaho. East of the Rocky Mountains volcanic action was very insignificant. When the lake-waters had risen to the height of the lowest depressions in the Sierra Nevada, they began cutting their gorges, and gradually subsided, the great Colorado River working down a channel from 4000 to 6000 feet deep, draining into the Gulf of California, just as Niagara is now cutting a gorge which will drain ultimately the whole Lake Superior basin. Great Salt Lake and Sevier Lake in Utah are fine examples of the great Tertiary lakes. They are salt, because the loss of water by evaporation is greater than the gain from the tributaries. But even now Great Salt Lake is visibly rising, and may become a fresh-water basin in time, after filling the whole of Salt Lake Valley. The present deposits of Malade River and Jordan into Salt Lake, of Sevier River into Sevier Lake, will in the future become "Bad Lands," if such communication should be established that the lakes could be drained completely either to the north, west, or south. So also would the deposits now making in Lakes Superior, Michigan, etc. Thinking of this future, as we have been dealing with the past, we may close with Dr. Newberry's words: "The cities that now stand upon their banks will ere that time have grown colossal in size, then gray with age, then have fallen into decadence, and their sites be long forgotten; but in the sediments that are now accumulating in these lake-basins will lie many a wreck and skeleton, tree-trunk and floated leaf. Near the city sites and old river-mouths these sediments will be full of relics that will illustrate the mingled comedy and tragedy of human life. . . . Let us hope that the future man, purer in morals and clearer in intellect than we, may find as much to admire in this first epoch of the reign of man as we do in those of the reign of mammals." (G. A. K.)

BAER, Karl Ernst von (1792–1876), a Russian naturalist, was born in Esthonia, Feb. 28, 1792. In 1810 he entered the University of Dorpat as a medical student, and graduated in 1814. He took a course of clinical medicine at Vienna, supporting himself meanwhile by the practice of his profession. He afterwards gave up the study of medicine, finding natural science more congenial, and took up the subject of comparative anatomy under Prof. Döllinger at Würzburg. He also studied in Berlin, devoting himself to physics and geology. In 1817 he proceeded to Königsberg, where he was attached to the faculty of medicine as prosector; in 1826 he succeeded Burdach in the chair of anatomy. He remained there until 1834, during which period his most important scientific labors were completed. In addition to his other duties he filled the posts of professor of zoology from 1819 and director of the anatomical cabinet from 1826. His studies while here were principally devoted to the elucidation of animal development. He discovered many new facts, advanced striking ideas, and fairly earned the title of "father of comparative embryology."

The earlier embryologists held varied and somewhat shapeless theories regarding fœtal development, one extreme opinion being that even in its most primitive stages of growth the embryo is a miniature copy of the man. After Wolff's time the idea prevailed that every animal in its development passes through forms successively resembling those of all lower animals. Baer proved that there are distinct types of animal development, of which the vertebrate type is the highest, and that each animal, in its successive stages of development, presents what are essentially the characteristics of the lower animals of its own type, rather than those of other lines of development. These views were presented in his *History of the Development of Animals* (1828), and, with some modifications, they are still the accepted views of biologists. In 1834, Von Baer received a call to the Academy of St. Petersburg as its librarian, and quickly became one of its most eminent members. He had previously resided in St. Petersburg for a short period in 1829, but continued there from 1834 until near his death, which took place at Dorpat, on Nov. 28, 1876. In 1851 his attention was attracted to the immense Russian fisheries and the irrational methods employed in them. His investigations continued until 1856, and the results were published in a great work in 1859. The fisheries were much improved in consequence. He made an expedition to the Caspian, on which he wrote an important work, *Kaspische Studien*. Von Baer had great acquirements in the sciences of zoology, comparative anatomy, embryology, physiology, anthropology, ethnography, etc. His works are marked by philosophic depth of thought and a clear and orderly exposition which renders them intelligible and generally attractive. He has written and thrown light upon many subjects, such as the laws of excavation of river-beds, glacial action, the Siberian mammoths, the potato disease, etc.

His principal published works are the *Epistola de Ovi Mammalium et Hominis Genesi* (Leipsic, 1827); *Entwickelungsgeschichte der Thiere* (1835); *Geschichte der Entwickelung der Fische* (1837); *Ueber doppelleibige Misgeburten* (1845); *Berichte über Wissenschaftliche Arbeiten und Reisen, etc.* (1855); and *Beitrag zur Kentniss des russischen Reiches* (1856). This last-named valuable publication was undertaken in association with Helmersen, and numbered 26 volumes. Among his latest works is an autobiography, his *Reden und kleine Aufsätze vermischten Inhalts* (1864–75). He left behind him a large number of manuscripts and unfinished works. His writings show a mind of a very high philosophical order, and, while frequently displaying a curious dry humor seldom found in scientific works, they are full of ideas in advance of his age.

BAGEHOT, Walter (1826–1877), an English author, critic, journalist, and economist of considerable eminence, who was born at Langport, in Somersetshire, on Feb. 3, 1826, and died at the same place on March 24, 1877, after editing for the last seventeen years of his life the London *Economist*, of which, in right of his wife (the eldest daughter of the late Right Hon. James Wilson, the founder of that journal), he was part proprietor. The books published in his lifetime were those on *The English Constitution* (Henry S. King, now Kegan Paul, Trench & Co.), quite the best book of the kind now in existence, and used as a text-book at Oxford as well as in some of the American universities; on *Physics and Politics* (same publishers), a very thoughtful application of Darwinian principles to the illustration of the conflict for existence amongst states; and on *Lombard Street* (same publishers), "a description of the money-market." But five volumes of essays were published after his death by Messrs. Longman, mostly consisting of essays which had been corrected and published by himself in a detached form in different publications during his lifetime, of which the two volumes of *Literary Studies* and the volume of *Biographical Studies* were perhaps the most brilliant; though the volume of *Economic Studies*, and that published immediately after his death on that remarkable *Depreciation of Silver* (Kegan Paul, Trench & Co.) which had taken place in the decade between 1865 and 1875, were of great interest to political economists.

Bagehot was sent to school in Bristol, where his mother's brother-in-law, Dr. Prichard, the author of a remarkable book on *The Races of Man* (which Bagehot read early, and the influence of which is plainly visible in his own book called *Physics and Politics*), lived. With him he used to spend his half-holidays and to hear interesting discussions on many of the subjects which he handled so ably in later life. In 1842 he was entered as a student at the University College, London, where he spent several years of very happy study, his favorite reading being at that time books on mathematics, poetry, history, and metaphysics. Here he formed many friendships which lasted as long as his life; for example, with R. H. Hutton, who was afterwards associated with him in the editorship of the *National Review*. Another intimate friend was W. C. Roscoe, a grandson of the author of the *Life of Lorenzo de Medici* and *Leo X.*, himself a poet and critic of very high powers. The late J. Langton Sanford also, a sagacious historian of the Puritan revolution, was one of his intimate friends, as well as Mr. T. Smith Osler, a Chancery barrister whose admirable account of Bagehot's powers as a talker will be found quoted farther on in the present article. Among Bagehot's teachers at University College, London, were the late Professor De Morgan and the late Professor Long, to both of whom he felt himself under the strongest intellectual obligations to the end of his life. The former, a very profound writer, and still more thorough lecturer, on all the departments of mathematics, was even more skilful at probing to the bottom the logic of the sciences; for example, in showing the danger of dealing hastily with conceptions so bewildering as those of negative quantities, or infinite quantities, or the so-called "impossible quantities" involving the square root of a negative quantity, and in explaining the reserves under which alone the mathematician is warranted in treating these rather bewildering conceptions with any confidence and in eliciting from them conclusions on which he may rely. Professor Long, on the other hand, one of the most accurate scholars and most unconventional thinkers of his day, a great lover of Marcus Aurelius and a great devotee of the jurisprudence of Rome, had a genuine talent for pricking the various inflated bladders of pretentious and conceited ambition with which his duties as a professor brought him into contact, and for helping those of his pupils who had any gift for it to become as sincere and modest as himself. Bagehot profited greatly by the lessons of both teachers. He learned mathematics enough to obtain the gold medal in mathematics when he took his degree, but he learned much more of the method and logic of the science than he learned of the science itself; and any one who knows his writings well will find in his subsequent treatment both of philosophical and of economic problems—for example, in such essays as that on "The Ignorance of Man," and in such essays as those on the "Postulates of Political Economy"—the amplest traces of the teaching of Professor De Morgan, and will observe the strength with which he had seized "the theory of limits," and had applied it to moral and physical sciences with which it would seem at first sight to have little to do. In the same manner he learned from Professor Long much both of the courage to admit the extremely empty and unsatisfactory character of much which is apt to be called historic knowledge, and of distrust of those ambitious guesses which, like those of Niebuhr's recast of early Roman history, represent themselves as recoveries of the past. In such essays as that on the late Sir George Cornewall Lewis or that on Clough it is easy to see the fruits of the teaching of Professor Long. Bagehot took his bachelor's degree in the University of London with the highest mathematical honors in 1846, and his master's degree in the same university in intellectual and moral philosophy and political economy in 1848, when he gained the gold medal, and immediately after began to read for the bar with Mr. (now Vice-Chancellor) Hall, and subsequently in the chambers of the late Mr. Quain, Q. C., afterwards Mr. Justice Quain. In these last chambers he learned the now almost forgotten art of "special pleading," of which he writes soon after to a friend: "The only thing I ever really knew was special pleading, and the moment I had learned that, the law reformers botched and abolished it. It was a very pretty art, and the only trade in which the logical faculties appear to be of any particular service. It was therefore the champagne of life, but this people which knoweth not the law went and abolished it." Bagehot, indeed, often spoke of the pleasure which his legal studies had given him, and of the great regret with which he ultimately decided in favor of the bank and the mercantile business rather than of the work of the bar. This he determined on in 1851, though not without reluctance.

Before finally leaving the study of law and settling down to the business of mercantile and banking life Bagehot spent some months in Paris, where he happened to be at the time of the *coup d'état* in December, 1851. He addressed seven letters on that subject to the editor of a little weekly paper with which a few of his friends were at that time connected, *The Inquirer*, and those letters have been reprinted in the appendix to the first volume of his *Literary Studies*, published since his death by his friend R. H. Hutton. These remarkable letters, though youthful in style, are certainly amongst the most brilliant of Bagehot's writings.

In the year 1855, when the Crimean war was already far advanced, and when Bagehot was deep in banking and ship-owning, the *National Review* was founded, of which he and his friend R. H. Hutton were made joint editors, he remaining one of the editors till the *Review* ceased at the close of 1864. In this *Review*, established by a knot of men who desired to combine with the advocacy of strongly liberal though by no means democratic political principles a very comprehensive theology of the Christian type, Bagehot wrote his most brilliant literary productions; indeed, with one or two exceptions, which were contributed to the *Prospective Review*, in some sense the predecessor of the *National*, and one or two which appeared in the *Fortnightly Review* after the *National* had ceased to exist, his best literary work is to be found in the pages of this *Review*, from which it has been collected and republished in the two volumes of *Literary Studies* (Longmans, 1879) and the volume of *Biographical Studies* (Longmans, 1881).

The book on *The English Constitution* was begun in the spring of 1865, before the death of Mr. Lincoln, many months before the death of Lord Palmerston, and first published as a whole in 1867; it has now reached its fourth edition, but the second edition, published in 1872, contains a very valuable introductory essay which is almost essential to the finished work, as it contains Bagehot's first reflections on the working of Mr. Disraeli's Reform Act—an act passed early in 1867, and therefore not criticised in the original book. It is not to be wondered at that this book has been widely read in the United States, for it contains a constant running criticism on the Constitution of the United States, which Bagehot had very carefully studied, and which he rightly regarded as one of the most astonishing experiments which the political genius of man had ever made—one all the more instructive, though also all the more difficult and delicate, for being so deliberate and voluntary—so little of a growth, so much of an achievement.

Bagehot's main idea in his book on the English Constitution is to show that its great merit is very far from being the merit usually attributed to it in the theoretical books on the constitution—namely, that it is a constitution of "checks and balances" in which you have three co-ordinate powers, the monarchy, the aristocracy, and the Commons, carefully balanced against each other. Bagehot held its chief merit to be, in practice, one of an exactly opposite kind—namely, that it concentrates power and responsibility so effectually in the nominees of the Commons as to make the House of Commons the focus at once of political interest, of political instruction, and of political power. Not that Bagehot underrated either the popular value or the legal rights of the throne and of the House of Lords. On the contrary, he insisted much on them, though he saw that both the one and the other are useful chiefly, if not exclusively, through the effect they produce on the minds of the people, and ultimately therefore on the feeling and action of the House of Commons. His view was that the "dignified parts" of the English Constitution are of enormous use through the confidence they excite and the imaginative impression they produce on the people. The "*theatrical* elements" of the constitution, as he calls them, are of vast importance in satisfying the minds of the people, and producing that sense of unity and security, and that deferential attitude towards their leaders, which mainly renders parliamentary government possible; but the useful and efficient part of the constitution is the kernel of the parliamentary system, the House of Commons as the electors of the Cabinet. "We have made," he wrote, "or rather stumbled on, a constitution, which—though full of every species of incidental defect, though of the worst workmanship in all out-of-the-way matters of any constitution in the world—yet has two capital merits: it contains a simple efficient part which, on occasion and when wanted, *can* work more simply and easily and better than any instrument of government which has yet been tried; and it contains likewise historical, complex, august, theatrical parts which it has inherited from a long past—which *take* the multitude—which guide by an insensible but an omnipotent influence the associations of its subjects. Its essence is strong with the strength of modern simplicity; its exterior is august with the Gothic grandeur of a more imposing age." What he appreciated most in the constitution of the United Kingdom, and desiderated most in the Constitution of the United States, was "the close union, the nearly complete fusion, of the executive and legislative powers." The old theory that the executive and legislative powers were quite separated and disjoined he showed to have no application at all to modern times; and he held, moreover, that the actual separation of the executive from the legislative powers, as it exists in the United States, tends not to remedy the evils peculiar to democracy, but on the whole to increase those evils by weakening both the executive and the legislature. It is the Cabinet—virtually elected by the legislature—which really exercises in England the powers of the executive, and exercises them with a view to win and keep the confidence of the legislature. He defined the Cabinet as the committee which held the legislative and the executive powers of the state in close combination. "It is," he wrote, "a hyphen which joins, a buckle which fastens, the legislative part of the state to the executive part of the state. In its origin it belongs to the one; in its functions it belongs to the other." And as holding for all practical purposes the power to dissolve the really effective part of the legislature, the House of Commons, it does not give the legislative part of the state power to absorb the functions of the executive part of the state, but really *fuses* the two. "Either the Cabinet legislates and acts, or else it dissolves. It is a creature, but it has the power of destroying its creators. It is an executive which can annihilate the legislature, as well as an executive which is the nominee of the legislature. It *was* made, but it can unmake; it was derivative in its origin, but it is destructive in its actions." In this respect the great rival system is the presidential system, in which the executive functions of the state are carefully separated from the legislative, so that neither can interfere with the other, except, indeed, up to a fixed point carefully predetermined by the constitution; and although at stated periods the people themselves can interfere with both, the first result of this separation is, says Bagehot, that the executive, even though fully retaining the confidence of the people, cannot necessarily get even the taxes it wants, and so ceases to be truly executive, since it cannot execute what it decides on. The Secretary of the Treasury must try to get a chairman of the finance committee who likes his tax, and through him must try to persuade, first the committee, and then the House, to adopt it. But all this is a most difficult process, and if he fails the executive is not responsible for the failure; the legislature is responsible. And the people do not really know whom to blame, the executive for proposing a wrong tax or the legislature for refusing a right one. There is thus no centre of responsibility anywhere, and therefore no popular means of judging the ministry by its fruits. But even this is not, according to Bagehot, the worst result of separating so effectually the executive and the legislative powers. A still worse result is that while Cabinet government educates the nation in political life, the presidential government fails to educate it. The fact that speakers in Parliament may turn out a government makes speeches in Parliament matters of the greatest interest to which the people carefully attend. "All men heed great results, and a change of government is a great result." Debates which end, or may end, in such an event are anxiously listened to, and instruct the people by the discussion of the true issue. The debates in the American legislature have no such effect, and the consequence is that they have very little importance to the national imagination. The ministers of the United States therefore have not the power or the influence of English ministers.

Further, Bagehot found great fault with the machinery of double election by which the President is chosen, and contrasted it unfavorably with the very different machinery by which the English prime minister is chosen. The electoral college in the United States is chosen for a single purpose—to choose a President for four years, and as soon as that duty is performed it is dissolved and no one hears of it again. The effect of that is that the people who take the most vivid interest in the result select a body of mere delegates, whose votes are already pledged, and the double election turns out not merely a farce, but something worse, since the process is apt to result in electing the candidate against whom there is least political combination, instead of the candidate in whom there is the greatest political trust. The English Parliament is also elected very often with positive instructions on the part of the majority of the electors to return a particular candidate to power in the first instance. But then the case differs materially in two particulars. In the first place, the candidate in whom the people confide most is sure to be returned, because the confidence reposed in him is due to his influence over the legislature, which he must lead, and it would be simply impossible for an unknown man to lead the legislature. In the next place, the electing body has not simply to elect, but to act under the guidance of the man elected, and it may be that he will not continue to retain the confidence of that body. This was Lord Palmerston's case in 1857 and 1858. The House of Commons of 1857 was returned simply to support Lord Palmerston, and it placed him in power at once. But Lord Palmerston somewhat presumed upon the results of that election; he treated the House of Commons with a certain jaunty air of patronage, and the consequence was that at his first doubtful act of policy, when he introduced the Conspiracy Bill to put down conspiracies hatched in England against foreign governments, the same assembly which had placed him in power removed him from power. Bagehot held that an assembly which had not only to elect the chief of the executive, but to act with him after it had elected him, was much better fitted for the electoral duty itself than one which had nothing further to do with him after the election was made. In the one case the election must proceed on grounds of confidence and knowledge, while in the other the confidence and the knowledge might serve rather to render the object of them ineligible than to secure his election. Moreover, the power of the elective body to withdraw its confidence, and, subject to the consequences of another appeal to the country, to terminate the power it had bestowed without waiting for the expiration of a fixed period, so greatly adds to the importance of the elective body itself that this also is chosen for its general discretion and its power of judgment in circumstances not yet foreseen; while an elective body chosen only to perform a single act, and then to be dissolved, like the electoral college of the United States, is not selected with the same care, since it is known that its continuous discretion and judgment can never be put to the proof.

To go now to the criticism passed in this remarkable book on the functions of the House of Commons, Bagehot was almost the first to point out what had never been properly pointed out before—how paradoxical a form of government "government by public meeting" really is; and to this part of his book the action of the Irish representatives since his death has lent an almost prophetic significance. "Of all odd forms of government," he wrote, "the oddest really is government by a *public meeting*. There are 658 persons collected from all parts of England, different in nature, different in interests, different in look and language. If we think what an empire the English is, how various are its components, how incessant its concerns, how immense in history its policy: if we think what a vast information, what a nice discretion, what a consistent will ought to mark the rulers of that empire, we shall be surprised when we see them. We see a changing body of miscellaneous persons, sometimes few, sometimes many, never the same for an hour; sometimes excited, but mostly dull and half-weary, impatient of eloquence, catching at any joke as an alleviation. These are the persons who rule the British empire, who rule England, who rule Scotland, who rule Ireland, who rule a great deal of Asia, who rule a great deal of Polynesia, who rule a great deal of America, and scattered fragments everywhere. . . . You have not a perception of the first elements in this matter till you know that government by a *club* is a standing wonder" (2d ed., pp. 138, 139). The only condition which could render this marvel possible, is, said Bagehot, party organization, and the moment party organization fails, the moment you get any group in the House of Commons which owns allegiance to no party and wishes to render parliamentary government impossible, that moment government by public meeting becomes impossible until you obtain or take power to silence the anarchic group. "Efficiency in an assembly requires a solid mass of steady votes; and these are *collected* by a deferential attachment to particular men or by a belief in the principles these men represent, and they are *maintained* by fear of these men—by the fear that if you vote against them you may yourself soon not have a vote at all" (ibid., p. 142). That is, if a group of members have no attachment to the leaders on one side or the other, and no fear that if they vote against them and Parliament be dissolved they will be punished for their votes by not being re-elected, then they can and will disorganize the governing assembly in which they sit; and this is just what the extreme Irish members since this book was written have effected. These extremists feel no loyalty to the leaders on either side of the House; they are well convinced that the more odious they make themselves to the loyal constituencies of the United Kingdom the more popular they will be with those disloyal constituencies which sent them to Parliament; and consequently till they are silenced or expelled they have the game in their own hands.

Bagehot held, too, that the ultra-democratic schemes for the division of England into uniform electoral districts, and the scientific schemes, such as that which has been propounded by Mr. Hare, for the more effective representation of like-thinking men all over the country, would, by throwing the management of the electoral system into the hands of professional managers, destroy the amenability of the House of Commons to that moderate and common-sense public opinion without which government by a public meeting is practically impossible.

On the subject of the House of Lords, Bagehot took what may be called a rationally conservative view. He did not consider that the House of Lords is in any sense an ideal second chamber. First of all, it has very little life. "The cure for admiring the House of Lords is to go and look at it." "On an ordinary day there are perhaps ten peers in the House, perhaps only six; three is the quorum for transacting business. A few more may dawdle in or not dawdle in; . . . but the mass of the House is nothing." Next, it is almost wholly made up of large landlords, and here again the defect on which Bagehot insisted so forcibly has received most impressive illustration since the question of the Irish land laws has been uppermost. This uniformity of structure makes the Lords "not impartial revisers" of the legislation of the Commons, but "biased revisers." Again, the House of Lords is not, as a whole, intelligent; it was, for instance, steadily opposed to free trade when all intelligent men were aware that free trade would be the greatest possible boon to the country. Again, the House of Lords is not only not intelligent; it is not even business-like. "There is no educated human being less likely to know business, worse placed for knowing business, than a young lord. Business is really more agreeable than pleasure; it interests the whole mind, the aggregate nature of man more continuously and more deeply. But it does not *look* as if it did. It is difficult to convince a young man who can have the best of pleasure that it will" (ibid., p. 117). The House of Lords is timid as well as wanting in business-like power. It is difficult to persuade the ordinary peer that, since the House of Peers must give up their judgment to the Commons on important matters, they need take the trouble to maintain a sort of censorship on less important matters. On such matters the mass of the Lords are too timid to rouse themselves: "Most lords are feeble and forlorn." Bagehot held that all these grave defects would have been greatly lessened by Lord Palmerston's plan for the creation of life-peers of proved ability, not rich enough to support an hereditary title, but with sufficient means to support their own function of life-peers respectably.

And of this scheme he was a warm adherent. But even to the existing House of Lords he was friendly. It had the greatest of all advantages, he said, that the country was used to it, and liked it, which would not apply to any novel revising assembly invented for the purpose of supplying its place. Therefore he liked the House of Lords, so long at least as its power is exercised "very timidly and very cautiously." It should never or hardly ever, he thought, thwart the House of Commons on a first-class subject, because it exercised, as he held, a very conservative influence over the plutocracy, and through the plutocracy over the mass of the English people. Some clever lords, he says, in his preface to the second edition of 1872—referring no doubt to a well-known view thrown out by the present marquis of Salisbury—ask, "Why are we not in the Commons, where we could have so much more power? Why is this nominal rank given us at the price of substantial influence? If we prefer real weight to unreal prestige, why may we not have it?" To this question Bagehot replies that "the whole body of the lords have an incalculably greater influence over society while there is still the House of Lords than they would have if the House of Lords were abolished; and that, though one or two clever young peers might do better in the Commons, the whole order of peers, young and old, clever and not clever, is much better where it is. The selfish instinct of the mass of peers on this point is a keener and more exact judge of the real world than the fine intelligence of one or two of them" (ibid., Introduction, p. xxxi.). But why did Bagehot wish to see the influence of this not very wise or business-like or active-minded assembly maintained over the plutocracy? He gives the reason with perfect candor: it is because he was exceedingly afraid "of the ignorant multitude of the new constituencies." "I wish to have as great and as complete a power as possible to resist it. . . . As I have explained, the House of Commons still mainly represents the plutocracy, the Lords represent the aristocracy. The main interest of both these classes is now identical, which is to prevent or to mitigate the rule of uneducated numbers. But to prevent it effectually they must not quarrel among themselves; they must not bid one against the other for the aid of their common opponent" (ibid., Introduction, pp. xxvii., xxviii.). Bagehot believed that by using the influence of rank to support the influence of wealth, the majority of the uneducated members of the new constituencies might be persuaded to follow the united influences, and not to set up a policy of their own, which could not but be an ignorant and rash policy. In a word, Bagehot wished to maintain the influence of the House of Lords rather because he thought it would help to prevent the country from approving hurtful measures, which the democracy might otherwise take a fancy for, than because he had any great political confidence in its work as a revising chamber or any wish to see it thwarting the House of Commons.

Such is a brief and imperfect account of quite the best and most instructive book ever written on the constitution of the United Kingdom as compared with the Constitution of the United States, which Bagehot had always in his mind, and of which he shows a far more minute knowledge than in this brief *résumé* I have been able to indicate. In his later life he was, as editor of the *Economist* and also as a personal friend of many of the most weighty statesmen of the day, in constant communication with the whole political and parliamentary world; indeed, all the greater figures in both parties were perfectly familiar to him. His whole book was based on the notion that a semi-democratic government may be harmless, and may even be useful, so long as the people remain deferential to the opinions of their best-educated leaders, and so long as you can interest the whole constituency in the choice of those leaders. On the latter point he thought that Cabinet government was very successful in promoting attention to the personal qualities of the leaders as the main question with which popular constituencies were competent to deal. How to keep a great democracy deferential to educated and thoughtful leaders he thought a very much more difficult problem. But he trusted a good deal to the natural disposition in every English class to follow the lead of the class above it (so long, at all events, as the highest class do not ruin their own cause by falling out with the capitalists and traders of the country) for the conservative influence which shall prevent rash and ignorant experiments of a revolutionary character. This book has naturally attracted great attention on the continent of Europe, and has been translated into German, French, and Italian.

The next book which must be noticed, and which appeared in 1872, though nothing like so adequate to its subject as that on the English Constitution, contained so valuable a germ of original thought that it has attracted even more attention amongst continental thinkers, and has been translated into Spanish, Hungarian, and Russian, no less than into the ordinary languages of European currency; and the English version has gone through four editions. This was called "*Physics and Politics*, an attempt to apply the Principles of Natural Selection and Inheritance to Political Society." It was published in what was called "The International Scientific Series," and certainly was most appropriate to that series, since its main idea was to explain why one group of men had prospered and another had failed in the attempt to found a stable society and transmit its institutions to posterity. It is obvious that all the more important books of Charles Darwin, and also the very striking book of Sir Henry Maine on *Ancient Law*, had made a profound impression on Bagehot's mind, and had worked together to suggest to him a very prolific and original idea—namely, that the success in founding states achieved in different ages by different groups of men had been due to very different and in some respects almost contrasted causes in different ages of the world—in the earliest time chiefly to their aptitude for taking a common stamp of authoritative custom, and for resisting the encroachments on that authority of restless individual taste and choice; in the later times, to the aptitude for introducing well-chosen variations of a fruitful character breaking through the monotony of those customs—to an aptitude for cautiously deviating from them so far as to test and canvass useful modifications or gradual transformations of them. "In early times," says Bagehot, "the quantity of government is very much more important than its quality. What you want is a comprehensive rule binding men together, making them do much the same things, telling them what to expect of each other—fashioning them alike, and keeping them so. What this rule is does not matter so much. A good rule is better than a bad rule, and any rule is better than none" (p. 25). The object of this common rule is to bring about drill, discipline, involuntary co-operation. The men who are able to act together, and still more those who could not help acting together if they would, are sure to get the better of the men who cannot act together, who have no notion what combined action means. The age of servitude must be long, and must cumulate its effects till they have so influenced the nature handed down to posterity that the habit of mutual regard and prompt co-operation has become a second nature, before mankind is ready for the age of freedom.

The reason that commerce was thought so dangerous to national life in the old days was precisely this, that intercourse with foreign nations broke the yoke which was slowly being forged for the separate races. Bagehot appeals to the old saying, "Whoever speaks two languages is a rascal," to show how deep was the impression that familiarity with more than one kind of national genius or society broke the characteristic spell over the mind exerted by that national genius or society, and so gravely diminished the chance of subduing individual caprice to the steady step and collective feeling of a nation's life. Commerce breaks down the prejudices of races. But Bagehot held that before these prejudices can be safely broken down they must have moulded those who felt them to a common habit of thought and feeling—to a readiness for obedience, quickness of sympathy, steadiness in common attack or common defence; in one word, to capacity for that physical and moral *esprit de corps* which is the first condition of a successful social organization. The "survival of the fittest" society will then end at last in a society so well tempered and disciplined to common action and mutual help that it will admit of variation of habits, not only without harm, but even with the best results. In the modern world the savage withers away before the civilized man, so much stronger has the civilized man become through the long weeding out of the ages. But it was not so in the ancient world. And in the modern world the difficulty is changed. It is no longer the race which takes the common stamp best that succeeds best, but the race which is not *too* deeply marked by the common stamp, but only enough marked by it to admit of variations for the better. The arrested civilizations—like that of China—do not fail for *want* of the common drill, but through the excessive effect of the common drill. The yoke the Chinese needed to subdue them was so potent that it did more than subdue them, it enslaved them. Only a few groups of men were fortunate enough to take the full impress of the common legal yoke, and yet not to have it so deeply stamped into the very soul as to extinguish original movement, individual spontaneity. The great gift of all—the gift which Bagehot attributes to Rome and England alike—is "the gift for conservative innovation, the gift of *matching* new institutions to old" (p. 81). Nation-making is the art of producing and fostering types of character sufficiently like the main stock to avoid all danger of decomposition and dissolution, and yet sufficiently different from it to engraft upon it some new and life-giving variety. Only very late in the development of mankind arose what Bagehot calls "the age of discussion;" nor could it have arisen safely till national character had been so moulded by the intellectual prepossessions of ages that even when these prepossessions were removed it would still obey one common impulse and respond to the same fears and hopes. Bagehot maintains, however, that civilized ages in inheriting the nature which was victorious in barbarous ages have inherited much that is by no means suited to its new conditions; and amongst these superfluities handed down to us by barbarous ages he counts especially an excess of energy, an excess of disposition "to be doing something," even when there is nothing very useful to do; and he relies on the sceptical influence of "the age of discussion" to check this inherited excess of active impulse. "Most men inherited a nature too eager and too restless to be quiet and find out things; and even worse—with their idle clamor they 'disturbed the brooding hen;' they could not let those be quiet who wished to be so, and out of whose calm thought much good might have come forth" (p. 187). The military dispositions and tendencies of fighting ages are the *damnosa hereditas* of the age of work; nay, the mischievous laboriousness of the age of work is the *damnosa hereditas* of the age of thought. Bagehot hopes that "the age of discussion" will be one of "animated moderation" (p. 200), in which the free canvassing of all ideas will tend to check impatient and over-hasty action, and to expose the rashness of revolutionary change. So that *Physics and Politics* comes in the end to the same conservative-liberal result, from a speculative point of view, as the book on *The English Constitution* had arrived at from a purely political point of view.

Bagehot published in 1873 one more book which achieved a considerable reputation, and is now in its seventh edition—a book on a somewhat more technical subject, which he called *Lombard Street*. It was on the English money-market and system of banking, and its chief aim was to prove that the dependence of all the joint-stock and private banks in the United Kingdom on the Bank of England itself for their cash reserves was a great misfortune, and led to a thoroughly defective system of banking, though one with which—thanks to the identification of the Bank of England with the state—the whole commerce of the country is now so bound up that it is impossible to alter it. Nevertheless, he held that every effort should be made, by various devices which he pointed out, to compel the keeping of a sufficient reserve in cash against emergencies and panics. No private person had more influence over the financiers of England than Bagehot, probably none so much. He was the friend and adviser of almost every Chancellor of the Exchequer in succession between 1860 and 1877, and when he died not a few of the leading statesmen of the day, both Liberal and Conservative, gave public expression to their sense of loss. As editor of the *Economist* he held a position of great influence, and the *Economic Studies* which were published after his death, though incomplete in many parts, showed that his position as a theoretical economist would have rivalled that which he had long attained as a practical critic of the finance, the commerce, and the money-markets of the world. As an economist he took up a position midway between that of the school of Senior, which held that political economy is a science explaining the necessary laws of the production and distribution of wealth—laws good for all places and all times—and the school of Cliffe Leslie, which denies that there is, properly speaking, any abstract science at all, and maintains that you must apply the strictly historic method and ascertain what the actual facts are as to the production and distribution of wealth at different times and at different places. Bagehot held that political economy is an abstract science, but one depending for its truth on various "postulates" which never have been absolutely true in any place or at any time, but which are nearly enough true in modern England to yield approximately correct results for our guidance and warning. He denied, however, that many of these postulates are applicable to countries like India at all. Fragmentary as some of the essays are, the posthumous *Economic Studies* are full of shrewd reasoning and wide knowledge. Bagehot's defence for the capitalists, that they do not merely find the ready money for starting operations, but furnish in fact all the prevision and calculation that is needful for success—that they are to trade what the commander-in-chief of an army is to war, the pivot of all the operations, those whose sagacity can alone ensure success, just as their rashness or improvidence ensures failure—furnishes indeed the only adequate answer to the complaints of the Socialistic school, that the laborer whose labor is of the essence of the enterprise should enjoy so much less of the reward. Equally true it is that the general of an army can do nothing without the ranks of soldiers; but no one doubts that the general has much more to do with the success or failure of the campaign than any single regiment of soldiers, nor that, if he does his work well, he should receive a reward equivalent to the reward of a large number of soldiers.

Bagehot was not merely a brilliant writer and an original thinker; he was one of the best talkers of his day. Some illustrations of his humor have already been given, but it would be a mistake to conclude this imperfect notice of him without quoting the admirable description of his conversational powers which has been given by his early friend, Mr. T. Smith Osler of the English Chancery bar. "As an instrument for arriving at truth," says Mr. Osler, "I never knew anything like a talk with Bagehot. It had just the quality which the farmers desiderated in the claret, of which they complained that though it was very nice, it brought them 'no forrader,' for Bagehot's conversation did get you forward, and at a most amazing pace. Several ingredients lent to this: the foremost was his power of getting to the heart of a subject, taking you miles beyond your starting-point in a sentence, generally by dint of sinking to a deeper stratum. The next was his instantaneous appreciation of everything you yourself said, making talk with him, as Roscoe once remarked, like 'riding a horse with a perfect mouth.' But most unique of all was his power of keeping up animation without combat. I never knew a power of discussion, of co-operative investigation of truth, to approach to it. It was all stimulus, and yet no contest." This passage admirably represents Bagehot's luminous talk. He vivified everything by his animation, and clarified everything by his keen, detached intellectual appreciation. As he himself quotes in relation to Ricardo the economist, he had a mind

> "Keen, intense, and frugal,
> Apt for all affairs."

But he had much more than this—a deep sense of the mystery of the universe, and a remarkable susceptibility to that exaltation of spirit which the contemplation of the Divine Life lends. In early life he was a great student of Emerson, and his favorite poet was Wordsworth. It was he who described Wordsworth as exciting "the fond enthusiasm of secret students, the lonely rapture of lonely minds," and he was one of the most devout of these students; his was one of the most passionate of those minds. He once wrote to a friend, "My friends say I am too sceptical, but I say I am only lazy in believing, as I am in everything else. Indeed, it seems to me that I do that better than I do most other things." Perhaps he did; for he had that vital hold on the most essential realities of life which made it certain to him that free-will and good and evil, sin and virtue, remorse and self-acquittal, were not dramatic illusions of the imagination, but were of the heart of the mystery of human existence, and he knew that at the one point in the history of man where the drama of spiritual life overshadows and almost obliterates the pageant of history, must be found the focus of the divine purpose for our race. But, well as he believed, it is as a thinker that his name will be remembered, for his thought flashes light, and unlike that intellectual power which "through words and things goes sounding on its dim and perilous way," his intellect gives you, in brief glimpses, a new knowledge of where you stand and whither you are going. (R. H. H.)

BAGGAGE is the term used in the United States and in Canada to denote the personal effects of travellers. It embraces what is known in England as *luggage*. The question as to what constitutes baggage in its relations to common carriers—and it is from this point of view that the subject is discussed in this article—is governed by many nice distinctions, such as the length of the traveller's journey, whether accompanied by his family or not, his place of residence, character, habits, social position, and fortune. That which would be esteemed baggage when owned by one person is not so considered when owned by another. The pipe of a smoker, the accoutrements of a hunter or fisher, the tools of a carpenter, or the jewels of a lady are considered baggage when owned and used by the traveller. Baggage also includes the money necessary for the expenses of the journey, weapons carried for self-protection, the bed of the poor man travelling with his family, and the wearing apparel of children. The application and adaptability of a thing to the particular and personal use of the passenger are necessary to fix its *status* as baggage, and nothing that does not form a part of his personality can be so considered.

Before the introduction of railroads the methods of waybilling were exceedingly crude, the small amount of baggage travellers were allowed to carry being transported under the eye of the owner. With the increase of facilities for the transportation of property and persons the disposition to carry baggage greatly increased. This increase necessitated the introduction of machinery by the carrier that would enable him to handle it accurately and quickly, and without the personal surveillance of the owner. Hence the present system, which may be briefly described as follows: To each piece of baggage transported a small piece of metal, called a "check," is attached by a leather thong. This check has a number stamped upon its face, with the name of the road issuing it. In the operations of the baggage department each station is assigned a number; when the number or name of the place of destination is not stamped upon the check it is marked in pencil upon a small pasteboard card which is attached to the check by the strap which secures it to the property. Where the traffic is great between two points, special or "reversible" checks are provided for use, the names of the points between which they are good being stamped upon their face. A duplicate check is given to the passenger in each instance. The property thus billed is delivered at its place of destination only upon surrender of the check delivered to the passenger. In the event of this check being lost, delivery is made upon satisfactory proof of ownership, accompanied by the filing of an adequate bond of security to protect the carrier against contingent loss. Payment for the lost check is also exacted.

In the distribution of baggage-checks for use a group of numbers is assigned to each station. These groups are never changed, so that those who are familiar with the numbers they contain or who have access to the lists can tell the point of departure of baggage bearing a particular check. The checks collected at stations to which baggage is billed are sent to the head-quarters of the company, and are there assorted and forwarded to the stations to which they belong. For baggage checked through over two or more roads reversible checks are used. These checks bear the names of the points between which they are good, and indicate the route over which the baggage is to pass. Reversible checks evince by the manner in which they are attached to baggage the direction in which the property is going. Another form of check—not in general use, however—permits the insertion in the face of the metal check of a card on which is written the name or number of the station to which the property is destined. A waybill, giving particulars of trains and numbers, accompanies all baggage for the information of operatives and for the purpose of forming a continuous record of each transaction. Baggage not taken by passengers into the cars is carried in a separate vehicle under the immediate charge of a train-baggageman. The conductor, unlike the guard in England, has nothing to do with the handling or care of baggage, except that he is generally responsible for the safe conduct of the train. Heavy penalties attach to the wilful damage or careless handling of baggage by attendants. Where the baggage-traffic at a station is sufficient to warrant it, it is placed under the immediate charge of a baggage-master, but the general agent of the company at each station has authority and personal supervision over the business. When trains approach the principal cities and points of juncture between different transportation lines, trustworthy and reasonable facilities are afforded travellers for checking their baggage to their hotels and residences or to the stations of the connecting lines over which they wish to go. The practice of charging for the care and storage of baggage not called for within a reasonable time is not general, though law and custom alike permit it or authorize the removal of the property to a public warehouse. When baggage is held by a carrier beyond the time legally required of him, responsibility as a warehouseman supervenes. Property not called for within one week is reported to the general baggage-agent; if not taken away within thirty days, it is forwarded to the head-quarters of the company. Unclaimed baggage may be sold after a certain time, varying from three to twelve months according to the laws of the different States, and after proper public notice.

The price of a passage-ticket includes the carriage of a reasonable amount of baggage without extra charge. East of the Missouri River passengers are allowed 150 lbs.; west of the Missouri River, 100 lbs. Larger allowances are, however, made to commercial travellers and theatrical companies. On many lines no organized effort is made to collect charges for extra baggage, except where the amount offered is grossly in excess of the weight allowed. Baggage is never weighed unless palpably in excess of the stipulated amount. The operation of checking requires but an instant, and the celerity with which it is performed permits the passenger to delay his arrival at the station until the last moment before the departure of the train. The practice on the continent of Europe of weighing every piece of baggage presented, and entering the weight of the same, with other particulars, on various records and returns before it can be forwarded or its owner permitted to enter the train, is never attempted in America, and if attempted would not be tolerated by the travelling public.

The issuing of checks (receipts) for baggage was at first voluntary on the part of the transportation companies, but the practice has become fixed in the customs of the country and is regulated by law in many States. The laws and the decisions of the courts as well also recognize and enforce the responsibility of the carrier in cases of loss or damage to the baggage of passengers; this responsibility cannot be evaded by any general notice to travellers, but in specific instances, where a contract is entered into between the carrier and the passenger, the responsibility may be limited to $100 or such sum as may be mutually agreed upon. As a matter of fact, however, this reserved right, for various reasons, is seldom exercised by carriers. The responsibility of carriers for goods transported as baggage extends only to such articles as the law construes as such. The failure of passengers to disclose the exceptional value of baggage does not release the carrier. Responsibility for baggage lost or damaged is determined by the laws of the State where the loss or damage occurred.

The American system of handling baggage is the result of fifty years of practical study and experiment. It has for its underlying principle the convenience and comfort of passengers. The perfection it has reached is largely due to the anxiety of railway managers to meet the demands of the community in which they do business. This anxiety is the product of a critical public spirit, and is evinced in other features of American railways, and is in many respects peculiar to them. In no other department of the service perhaps is it possible for a transportation company to afford the community so high and conclusive an evidence of its intelligence and amiability as in the appliances provided and the methods adopted for handling the baggage of its patrons. This fact is better appreciated and its obligations more fully met in America than elsewhere. The great advantages of the American system are the simplicity of its working, the celerity with which the traffic is handled, and the relief and security it affords travellers. It is well understood in the operations of the baggage department that loss or delay of property may not only work serious inconvenience, but actual suffering as well. In England receipts are not given except in isolated cases, and passengers are compelled, in consequence, to dance attendance in person upon the porters at the end of their journeys and at many of the points of transfer *en route* until the identification of their property has been fully established. In America, on the other hand, the token delivered to the passenger he may entrust to such public or private conveyance for the delivery of his baggage at his residence or elsewhere as he thinks proper. If he should be so unfortunate as to lose his check, his misfortune does not necessarily involve the loss of his property, provided the carrier is promptly notified. If, however, the latter in good faith delivers the goods without such notice upon presentation of the check, he is released from further responsibility. The advantages enjoyed by passengers in America in connection with the carriage and delivery of their baggage are not so much the result of any particular merit in the system of checking as of the facility that characterizes the conduct of the service. This facility is the result of the intelligence and trained accuracy of those who have it in charge. Complaints, nevertheless, not infrequently are made that station and train officials are not always careful in handling property entrusted to them. As a matter of fact, however, the percentage of damaged pieces, considering the excessive weight of many of the packages, the insecure manner in which they are prepared, and the haste with which they must necessarily be handled, is very light. The damage that actually occurs arises more often from the fault or thoughtlessness of owners than from carelessness or neglect upon the part of attendants. Owing to the different manner of treating baggage and the great average length of journeys in America the size and weight of the packages transported is generally greater than in Europe, where heavy and bulky trunks and cases are the exception.

Perfection cannot be claimed for the American system of checking baggage. Some of its merits have been pointed out. Its defects are: The expense attending the preparation of the large number of checks required to meet the possible demands of business, while many of them never are actually brought into use; the liability that the check may be mismatched, or, in other words, that the check given to the passenger may not be a duplicate of the one attached to the baggage; that by some error in reading or recording the numbers property may be miscarried or delivered to the wrong party. When mistakes such as those last mentioned occur, their effect is aggravated by the fact that the person presenting the check, being in many instances an omnibus or transfer agent, is not familiar with the property and does not therefore detect the error. Checks from their simple character, moreover, are easily counterfeited, and from the temporary manner in which they are attached to baggage may be fraudulently exchanged in the absence of the attendant. The heavy and bungling character of the check is also an objection. The mishaps and the inconveniences growing out of the mismatching of checks, however, overshadow all other evils of the American method. It is the sore spot in the system, its one irremediable defect. Many of the objections to the American system, including the mismatching of checks, are, it is believed, susceptible of removal or modification by the substitution for the metal check of the form of adhesive coupon waybill used in Europe. Indeed, if the European method of handling baggage were conducted with the intelligence and simplicity of the American system, and with equal desire to accommodate the public, its method of billing has many features superior to the American system of checking. The objection to the European method is the practices connected with the weighing of each package, and the indifference of the carrier to the inconvenience and discomfort of the passenger occasioned thereby. The coupon bill used in Europe may be consecutively numbered in triplicate by machinery, and not being detached until required for use, the danger of mismatching does not exist. Its compact bulk makes it more easily protected, and it may at slight cost be made difficult to counterfeit, or if counterfeited new plates may be easily and cheaply substituted for those in use. The receipt or coupon given to the passenger is also more easily and securely handled than the metal check. Many errors occur in connection with the American system through the habit parents have of giving their checks to children while *en route;* the checks thus entrusted to them are treated as playthings, and when opportunity occurs are freely exchanged for those in the hands of other children, or they are bartered in trade when occasion offers, to the great discomfiture of parents and the subsequent perplexity of carriers. The adhesive coupon bill used in Europe can be more securely attached to packages than the American check. It, however, disfigures the property, and if not obliterated or intelligently cancelled may occasion the subsequent miscarriage of the goods. Another objection that has been offered is the facility it affords the inquisitively inclined to trace the route of baggage where the bills that have been attached from time to time have not been eliminated.

Notwithstanding the objections to the American system, the practical danger under its operations from error or fraud is very small. The Pennsylvania Railroad Co. transported 1,070,451 pieces of baggage in 1879, of which not one piece was lost. This result, and others equally favorable that might be mentioned demonstrate the possibilities of the American plan. Its advantages over the English method, or lack of method, are obvious. (M. M. K.)

See Vol. III. p. 208 Am. ed. (p. 241 Edin. ed.).

BAIL, derived from Old French *bailler*, to deliver. Its most general signification is the delivery or release of a defendant into the custody of some person who becomes responsible for his appearance when summoned to answer a charge. At the present day the word has three distinct uses: it signifies the *act* of releasing a prisoner by becoming his surety, the surety itself, and the amount of money entered as security. In a more ancient sense the word also meant the delivery of any sort of real or personal property into the custody of another for safe-keeping, either for a specific purpose or otherwise, as to bail cloth to a tailor; and traces of this meaning are still to be found in our law phraseology.

The notion of mitigating the hardships of imprisonment in the cases of persons merely accused of crime by releasing them on a sufficient guarantee of return for trial is so very ancient that its origin cannot be traced with certainty. Rules and restrictions for its exercise are laid down with considerable exactness in the Roman civil law and in the Pandects of Justinian. A defendant, even if refused ordinary bail, might be placed *in libera custodia—i. e.*, in the safe-keeping of some high magistrate or private citizen of distinction, who thereby became responsible for his appearance. A distinct reference to bail is made in Acts xvii. 9, showing that its employment was usual at that time in the countries subject to Rome. In England, though the practice was discretionary at a much earlier date, the taking of bail was made compulsory on sheriffs by 23 Hen. VI. c. 9, and the privilege was extended in favor of defendants by successive statutes, until it was provided that no bail in civil actions should be required for an amount greater than that which the plaintiff should swear was due him in the action.

The following are the most important kinds of bail: *Bail above*, sureties who bind themselves to satisfy debt and costs or surrender defendant, provided judgment be against him and he fail to satisfy; also called *bail to the action*. *Bail below*, sureties to the sheriff for defendant's appearance or that he will enter bail above before return-day. *Common bail*, fictitious sureties entered formally in the office of the court, equivalent to entering an appearance. *Special bail*, responsible sureties entering as bail above. To be properly qualified for becoming bail a person must be reliable, must be subject to process of court in which it is entered, must be capable of entering into a contract, and must be able to pay the amount for which he becomes responsible.

In all civil cases bail may be given without dispute as a matter of right, and in actions for debt, to prevent discharge on common bail, the amount of the debt should be sworn to. In criminal cases, except those involving a capital offence either actual or possible, it is also allowed, and even in a capital case unless prohibited constitutionally or by statute, it is sometimes granted. The Constitution of the United States provides in the eighth amendment that excessive bail shall not be required—a somewhat vague restriction. In fact, the definition of "excessive bail" is, in nearly every case, subject to local usage.

For any crime against the Federal laws which is not capital bail may be taken before any judge of the United States or State supreme or superior court, or any chancellor or first judge of common pleas, or mayor, or magistrate; but in capital cases only before a judge of the Supreme, circuit, or district court.

The proceedings necessary for the entering of bail are the same in England and the United States, and need not be detailed here.

The bail is said to enter into a *recognizance* when the obligation is of record; when the sheriff is obligee it is a bail bond. If the bail is deemed excessive, it may be reduced at discretion of the court on application of defendant; and in general the liabilty of bail is limited by the bond, by the amount involved, and by special circumstances.

In consideration of the risk involved, the law gives a person who becomes bail for a defendant very extensive powers. The latter is supposed to be in his custody, and may be arrested by him on a bail-piece, even outside of the jurisdiction of the court before which the bail was entered or in another State. To effect the arrest, the bail may break open a door and command the assistance of the sheriff and the entire *posse comitatus*. The refusal of bail or its unnecessary delay is an offence against personal liberty, though not actionable unless malice be shown.

In general, a prisoner under final process—that is, serving out a sentence of the court—cannot be released on bail; but in modern times it has become the practice, by statute law, in certain special civil cases, to release even such under security in the nature of bail for a limited time and a specific purpose, beyond which he cannot lawfully extend his release.

BAILEY, PHILIP JAMES, an English poet, born at Basford, in the county of Nottingham, April 22, 1816. He attended for two years as a student at the University of Glasgow, but did not take a degree. In 1833 he was entered at Lincoln's Inn and sat in a lawyer's office: he became a barrister-at-law in 1840. While at the university he had produced a prize poem on *The Creative Imagination*, and the overmastering power of his own imagination was manifested in the colloquial poem which he published anonymously in 1839 entitled *Festus*. It was received with great favor in England and with enthusiasm in America, where it rapidly passed through several editions. It is very difficult to apply the rules of criticism to this poem; the keynote was struck by James Montgomery: "One feels as if one had 'eaten of the insane root that takes the reason prisoner,' and 'of the tree of knowledge of good and evil,' with strange elevations of spirit and stranger misgivings alternately glowing and shivering through the bosom." Although in the form of colloquy, the poem is not at all dramatic. The title, so like *Faustus*, prepares us for the imitation of Goethe upon which we enter in the colloquy between God and Lucifer in the first scene, laid in heaven. Abounding in passages of great beauty and power, the poem is wild, and in parts scarcely intelligible; there is a want of proper relations and proportions; the versification is frequently careless, and the prophetic dignity assumed at the outset is not well sustained. The subject of the poem is religious philosophy, which is studied by a burdened soul seeking help and support; it has been considered, to some extent, autobiographical. The admirers of *Festus* thought that a great poet had made his advent: he who could write portions of such a work before he was twenty must have grand things in store; but the unwarranted enthusiasm was unjust to the poet. The reaction came; *Festus* fell from its high estate, and no later work has buttressed his fame. In 1850 he published *The Angel World;* in 1854, the *Mystic;* in 1858, *The Age* (a satire in the form of colloquy); in 1867, *The Universal Hymn*—no one of which is of striking merit. (H. C.)

BAILIFF. This word, which has almost become obsolete in American law phraseology, is derived from the Old French *bailer* or *bailler*, "to deliver," and hence is primarily applicable to any person to whom any responsibility, care, guardianship, or authority has been *delivered* or entrusted.

In English law, the word, as defined by Blackstone, signifies a sheriff's deputy employed for the purpose of serving writs and executions. By the local usage of a few towns in England the sheriff himself is called by this title, and throughout the kingdom generally what in America are deputy sheriffs are known as "bound-bailiffs," vulgarly contracted into "bum-bailiffs." They acquire this name from being obliged to give security to the sheriff for a faithful performance of duty.

Stewards employed by private persons of large wealth to manage their estates are also called bailiffs in England, and there are several varieties of these two kinds, as bailiffs itinerant, water-bailiffs, bailiffs of husbandry.

Bailiff in account render, in English and American law, signifies a person to whom has been delivered by the owner, or "bailer," the custody and administration of lands or goods for the benefit of the owner, and who is liable to render at any time an account of the same.

Every bailiff is a receiver, but every receiver is not a bailiff. From a bailiff are required care, management, and skill, and an allowance is due him for the various expenses of his administration and whatever is done in his office by his direction, but a receiver who is not a bailiff is not entitled to compensation. (*Bouvier.*)

BAIN, ALEXANDER, LL. D., a British philosophical writer, was born at Aberdeen in 1818, entered Marischal College in 1836, and graduated M. A. in 1840. From 1841 to 1845 he taught moral and natural philosophy in Marischal College. In the latter year he was elected professor of natural philosophy in the Andersonian University, Glasgow. He became assistant secretary to the general board of health in 1848, which office he resigned in 1850. In 1857 he was appointed examiner in logic and moral philosophy in the University of London, which post he held until 1862. From 1858 to 1870 he acted occasionally as examiner in moral science at the India civil service examinations, and in 1860 was appointed Crown professor of logic in the University of Aberdeen. From 1864 to 1869 he again held the post of examiner in the University of London. Mr. Bain has published many valuable works on philosophical and other subjects. He wrote several of Chambers's *Papers for the People*, and the articles on language, logic, the human mind, and rhetoric in the *Information for the People*. In 1852 he issued an annotated edition of Paley's *Moral Philosophy*. His important works on mental science, *The Senses and the Intellect* and *The Emotions and the Will*, appeared in 1855 and in 1859, and were followed in 1861 by *The Study of Character, including an estimate of Phrenology;* in 1863, by an *English Grammar;* and in 1866, by a *Manual of English Composition and Rhetoric*. In 1868 he issued *Mental and Moral Science;* in 1870, *Logic, Deductive and Inductive;* in 1872, an *Elementary English Grammar;* in 1874, *Mind and Body;* and in 1879, *Education as a Science*. He was made LL.D. at Edinburgh in 1869. Mr. Bain is a philosopher of the school of Mill and Herbert Spencer. His principal works have been republished in America.

BAINBRIDGE, WILLIAM (1774–1833), an American commodore, was born at Princeton, N. J., May 7, 1774. He was a son of Dr. Absalom Bainbridge, a leading physician of New York. At the age of eighteen he was first-mate, and at nineteen captain, of a vessel engaged in foreign trade. When the U. S. navy was reorganized in 1798, he was appointed lieutenant-commandant. While cruising off Guadeloupe he was separated from the rest of his squadron and captured by French frigates. On his return to the United States he was placed in command of the brig *Norfolk*, and cruised in the West Indies, protecting American commerce and capturing several French privateers. In May, 1800, he was made captain, and commanded the frigate *George Washington*, which carried to Algiers the tribute then levied by the dey of that country. He was also compelled by the dey, most reluctantly, but in accordance with the advice of the American consul, to convey an Algerine embassy to Constantinople with tribute to the sultan. There Bainbridge was the first to display the American flag, and was treated with great distinction. In 1801 he commanded the *Essex* and cruised in the Mediterranean. When Tripoli declared war against the United States in 1803, he was appointed to command the frigate *Philadelphia* in the squadron under Commodore Preble, and did important service; but on Oct. 31, while chasing a blockade-runner in Tripoli harbor, his vessel grounded on a reef not marked on the charts. After five hours' exposure to the enemy's fire, every effort to move her having failed, she was scuttled and surrendered. She was afterwards floated off by a high tide, but was destroyed in the following February by Lieut. Stephen Decatur. Capt. Bainbridge and his 315 men were retained as prisoners till the close of the war, in June, 1805. On his return to the United States a court of inquiry was held, and he was honorably acquitted. For some years after he was engaged on merchant-vessels, but in the winter of 1811, when war with Great Britain was threatened, he hastened home from St. Petersburg, making an overland journey through Sweden. In company with Capt. Stewart he urged the Government—which during Jefferson's administration had reduced the navy to insignificance—now to give American seamen an opportunity to display their skill and heroism. In October, 1812, Bainbridge sailed from Boston in command of a squadron consisting of the *Constitution*, 44 guns, flag-ship, the *Essex*, and the *Hornet*. On Dec. 26, off the coast of Brazil, after a two hours' engagement, with a loss of only 34 men, he captured the British frigate *Java*, 49 guns, which had lost 124 men, including her commander, and had been reduced to a wreck, so that she was blown up by the victors. On his return to the United States, Commodore Bainbridge was received with enthusiasm; Congress voted a gold medal to him and silver ones to the officers, while $50,000 were distributed among the crew as prize-money. Henceforth the *Constitution* was popularly known as "Old Ironsides." In 1815, Commodore Bainbridge was appointed to command the Mediterranean squadron, and settled various disputes with the Barbary States. In 1821 he returned home, and was henceforth employed in important shore-service, being for a time president of the board of navy commissioners, which he had first suggested. He died at Philadelphia, June 28, 1833. His grandson, Wm. Bainbridge Hoff, is now a lieutenant-commander U. S. N.

BAINES, SIR EDWARD, an English editor and statesman, an advocate of education and temperance, was born at Leeds, England, May 28, 1800. His father, Edward Baines, was for many years the editor and proprietor of the *Leeds Mercury*, an influential Liberal paper, and represented Leeds in Parliament from 1834 to 1841. The son was educated in the Protestant Dissenters' Grammar School at Manchester, and at the early age of fifteen entered his father's office to acquire a practical knowledge of journalism. From the age of nineteen, for more than forty years, the chief editorial labor devolved upon him. In the discussion of the great questions of public policy that arose from time to time he took a prominent part on the Liberal side, advocating Roman Catholic emancipation, the repeal of the corn laws, free trade, and parliamentary reform. He was long noted as an earnest opponent of slavery, being active in the West India emancipation agitation, and afterwards a member of the British Anti-slavery Society. His articles against American slavery were frequently reprinted in the United States. During the American Civil War he was a firm friend of the Union, and strove to direct English public sentiment in that direction. His labors in behalf of popular education were long and varied. From 1825 to 1830 he delivered many lectures for the purpose of establishing mechanics' institutes, and in 1837 he assisted in forming the West Riding Union of Mechanics' Institutes, of which he has remained president for forty-five years. The union now comprises 260 institutes with 50,000 members, and 19,000 pupils attending the evening classes. Mr. Baines became a Sunday-school teacher at the age of fifteen, and continued to act as such till his public duties as member of Parliament prevented. He was elected to Parliament in 1859, succeeding his brother, Right Hon. M. T. Baines, as the representative of Leeds. He was one of the pioneers of the second great parliamentary reform, the reduction of the borough franchise, having introduced a bill for this purpose in 1861, and twice again before its accomplishment in 1867. He was a member of the schools inquiry commission in 1865, and supported the Endowed Schools Act of 1869 and the Elementary Education Act of 1870. As a dissenter he endeavored to procure the abolition of church rates and university tests, and supported the disestablishment of the Irish Church. In the general election of 1874 he was defeated. In addition to the public labors already noted, he has been active in the cause of temperance, having become a member of the temperance society in 1831, and having given his adhesion to total abstinence in 1837. He published in 1857 his *Twenty Years' Experience of Total Abstinence from Intoxicating Liquors*, and these views he has maintained to extreme old age. Though naturally thin and pale, he has been able to perform a vast amount of editorial and political work, and spent fifteen eventful years in Parliament without sensibly impairing his health. In securing the assent of his fellow-countrymen to his views and practice he has relied more on moral and religious agencies than on legislative measures. He has been a vice-president of the National Temperance League for many years, and president of the Congregational Total Abstinence Association since its formation. Besides his labors as editor of the *Leeds Mercury*, he is the author of a memoir of his father, of a *History of the Cotton Manufacture*, *A Visit to the Vaudois of Piedmont*, *The Woollen Manufacture of England*, and other works relating to the industries and commerce of Great Britain. In 1880 the people of Yorkshire deemed it proper to commemorate his eightieth birthday by raising an Edward Baines memorial fund of £3000, which he generously presented to Yorkshire College. The public presentation took place in Leeds, Dec. 3, 1880, and at the same time Mr. Herbert Gladstone announced that the queen had conferred on the venerable chairman of the council of the college the honor of knighthood.

BAIRD, HENRY CAREY, an American political economist, was born Sept. 10, 1825, at Bridesburg, now part of Philadelphia. His father, Thomas J. Baird, had served as captain in the War of 1812. After receiving an academic education, Henry entered the employ of Messrs. Carey & Hart, book-publishers, and in 1845 became a member of the firm. In 1849 he established a firm for the publication of industrial and economic books. In 1857 he was led to examine carefully the writings of his uncle, Henry C. Carey, and he has since been an enthusiastic disciple of that social philosopher. In dissemination of his own views and those of his preceptor he has distributed thousands of books and pamphlets, has written largely for newspapers and magazines, and has frequently appeared before committees of Congress as an expert witness. In politics he was a Whig until the organization of the Republican party. He then joined the latter, but left it in 1875 on account of its policy of resumption of specie payments by contracting the currency. He is now an ardent Greenbacker.

BAIRD, SPENCER FULLERTON, an American naturalist, born at Reading, Pa., Feb. 3, 1823, was educated at Dickinson College, Carlisle, Pa., and graduating in 1846 became professor of natural sciences in that institution. In 1850 he was appointed assistant secretary of the Smithsonian Institution at Washington, which position he held until 1878, when, on the death of Prof. Joseph Henry, first secretary of the institution, he was appointed his successor. His first literary and scientific work of any magnitude was a translation, from the German, of the *Bilder-Atlas* of Heck, an accompaniment to the *Conversations-Lexikon* of Brockhaus. This work, comprising four volumes of text and two volumes of plates, was commenced about 1848 and completed in 1851. He subsequently published many works and papers on natural history, especially on the mammals, birds, reptiles, and fishes of North America. The eighth volume of the *Report of the Survey of the Railroad Routes to the Pacific*, on the mammals of North America, and the ninth volume, on the birds, were prepared almost entirely by him, as well as a considerable portion of the tenth volume. In 1864 he published the first part of a *Review of North American Birds.* In 1873 there appeared a *History of North American Birds* in three volumes, prepared by him, with the co-operation of Dr. T. M. Brewer and Mr. Robert Ridgway. In 1871 he was appointed by President Grant United States commissioner of fish and fisheries for the purpose of investigating the cause of the decrease in the food-fishes of the United States and of devising means for restoring them to their former abundance. In 1872, Congress added to his duties the subject of the increase of the fishes by artificial propagation. During the entire period of his connection with the Smithsonian Institution he has had especial charge of the United States National Museum, an organization of great magnitude, for which a building covering two and a half acres of ground was erected in 1880. He now occupies the three positions of secretary of the Smithsonian Institution, director of the National Museum, and U. S. fish commissioner. The minor papers published by Prof. Baird are, for the most part, contained in the publications and annual reports of the Smithsonian Institution, and in the *Proceedings of the Academy of Natural Sciences*, Philadelphia.

BAKER, SIR SAMUEL WHITE, K. C. B., an English explorer, was born in London, June 8, 1821. He was educated at a private school and in Germany. Instigated by a strong desire for adventure, he organized, with his brother, Col. Baker, in 1848, an extensive agricultural colony at Nuwara Eliya, about 100 miles from Colombo, the capital of Ceylon. He remained six years in that country, of which he gives an interesting account in his *Eight Years' Wanderings* (1855). He went in 1855 to the Crimea, and subsequently engaged in organizing the first Turkish railway. In 1861 he made an expedition to Africa with the design of visiting the sources of the Nile and the hope of meeting the travellers Captains Speke and Grant. Having occupied several months in exploring the tributaries of the Atbara, he proceeded to Khartoum, where he organized his expedition for the White Nile. In Dec., 1862, he set out with a numerous train of assistants, and soon entered a waste of swamps and reeds. Proceeding to Gondokoro, he met Speke and Grant. The former told him of a large lake to the west, possibly a second source of the Nile, of whose existence he had learned from the natives. Sir S. Baker, who was accompanied by his wife, immediately undertook its exploration. He found great difficulty in organizing an expedition from the refusal of the natives to go farther, but without hesitation the explorer and his wife prosecuted their journey, and overtook a trading company, with whom they reached the Latooka country, 110 miles east of Gondokoro. March 17, 1863. He passed down the valley of the Asua, and on March 14, 1864, came within sight of the desired lake. He named this lake the Albert Nyanza, it forming, with the previously discovered Victoria Nyanza, the great reservoir of the Nile. This important expedition was followed by another in 1869 under the auspices of the khedive, of which the main objects were to suppress the slave-trade, to extend the boundaries of Egypt, and to develop the cultivation of cotton. Accompanied by a force of Egyptian troops, he reached Gondokoro on April 15, 1871, and penetrated to Ungoro, despite the resistance of the natives and the slave-merchants. After two years of struggles and dangers, accompanied throughout by his faithful and intrepid companion Lady Baker, he returned to Gondokoro in April, 1873, and reached Egypt in August, leaving Col. Gordon to complete his projects of conquest. Thence he returned to London. He is a fellow of the Royal Society and of the geographical societies of London and Paris, was made a knight of the Bath in 1866, and is a member of the French Legion of Honor.

In addition to the work above mentioned he has published—*The Rifle and Hound in Ceylon* (1853); *The Albert Nyanza* (1866); *Exploration of the Nile Tributaries of Abyssinia* (1870); *Ismaïlia, a Narration of an Expedition into Central Africa for the Suppression of the Slave-trade* (2 vols. 1874); *Cyprus as I Saw it in 1879* (London, 1879); and a work entitled *Cast Up by the Sea.*

BAKER, REV. WILLIAM M., minister and popular author, was born in Washington City, D. C., June 7, 1825, during the pastorate there of his father, Rev. Daniel Baker, D. D., himself one of the most widely known of Presbyterian divines of his day, both for his singular success in the pulpit and for his published works. His son was educated in Princeton, 1843–48, and held important pastoral charges in Texas, Ohio, Boston, and Philadelphia, his labors being crowned in each of these fields with marked results. Beginning with the preparation of his father's biography, he wrote many books, besides being a frequent contributor to many of the leading journals and magazines. Although pastor in the capital of Texas through the civil war, he held his church in unbroken connection with the Northern Assembly, and (1865) published, first as a serial in *Harper's Weekly*, a story entitled *Inside: a Chronicle of Secession.* Following upon this, sometimes as serials in the *Atlantic Monthly*, *Harper's Monthly*, and other periodicals, came *Oak Mot*, *The New Timothy*, *Mose Evans*, *Carter Quarterman*, *A Year Worth Living.* Some of his books, such as *Colonel Dunwoddie*, *Millionaire*, *His Majesty Myself*, *Blessed Saint Certainty*, *Thirlmore*, were published anonymously, but were sooner or later known as his by peculiarities of matter and manner which he was powerless to conceal. It may be added that Mr. Baker succeeds chiefly in the portrayal of character and in the inculcation of those principles which underlie all noble attainments. His books have had an extensive popularity and among the best class of readers.

BAKUNIN, MICHAEL (1814–1878), the founder and most prominent advocate of Nihilism, was born in 1814. He belonged to a rich boyard (noble) family which had supplied many distinguished men to the public service of Russia. One of his nearest relatives had been aide-de-camp-general of Alexander II., and one of his cousins governor-general of Siberia. Bakunin studied at the St. Petersburg Artillery School, and in the ordinary course would have had a commission in the Imperial Guard. But a quarrel, either with his father or with the school authorities, changed the current of his life, and instead of the fashionable society and residence at St. Petersburg which were privileges of the Guard regiments, he procured only an ordinary commission in the line, which meant banishment to a remote village district. In his new quarters he grew, according to his friend Herzen, indolent and morose, "dreaming away whole days in his dressing-gown and on his bed." At the end of two years he resigned in disgust and retired to Moscow. Here he joined a band of young men who studied German philosophy. Hegel had become the favorite, and his *Logik* the Bible of Bakunin and his friends; these latter including Herzen, afterwards editor of the famous *Kolokol* (the "Bell"); Turgenieff, the great novelist; Granowski, the historian; and Belinski, the critic. Bakunin soon assumed the leadership of this circle. His dialectical skill was incomparable, and his style of speech more vigorous and intense than that of any of his friends. Hegel's system was adopted as the basis of the new revolution. In 1841 Bakunin went to Berlin to drink his new philosophy at the fountain-source. Here he lived in the society of Turgenieff the novelist and others of advanced liberal opinions, but soon abandoned the haunts of men who were not prepared, like himself, to apply transcendental theories to matters of every-day life. Within the next few years he wandered to Dresden, Geneva, and Paris, creating a disturbance in each place, and was finally recalled by his government, which refused any further passports. In 1847 he was formally expelled from French territory, at the request of the emperor Nicholas, for a public speech in which he enjoined upon France the necessity of aiding Poland in establishing a republic in Russia. He preached, at Prague, Panslavism and armed opposition to Germany. Pursued by the Austrian police, he escaped to Dresden, where he arrived just in time to take an important part in a powerful insurrection. When the insurgents were compelled to surrender Bakunin incurred even their odium by advising that the city should be set on fire. He was captured by the Saxons and sentenced to death, but the penalty was commuted to life-imprisonment, and he was handed over to Austria. Having undergone various terms of imprisonment in many European states, he was given over to Russia in 1851, and spent the next five years in a Russian jail. On the coronation of Alexander he was banished to Siberia as a favor, and, his cousin being governor of this district, he was enabled, after a few years, to escape in an American ship, through Japan, to London. In that city he immediately joined the staff of the *Kolokol*, which Herzen was then editing with ability and success on principles of possible, and even practical, radicalism. Here Bakunin's influence destroyed the circulation of the paper, which was removed to Geneva. Here Bakunin quarrelled with Karl Marx and his International Society, and proceeded to found a new association known as "L'Alliance internationale de la Démocratie socialiste," which proved "too advanced" for any other form of society, and which was supposed to embody the principles of the vague term "Nihilism." It demanded, among other things, the abolition of the state as such; the extirpation of all religion and of all hereditary rights; the absolute equalization of all individuals; and the substitution of Collectivism for Communism. Bakunin now fell into bad repute with his own party in Russia, owing to the disgraceful conduct of an agent whose career he held up to public estimation. Gradually, French and German radicals repudiated the principles of the author of *L'Empire knouto-germanique et la Révolution sociale*, and Mazzini, in the name of Italian radicals, denounced the "Alliance." Bakunin died suddenly at Berne in the summer of 1878, deserted by all except a few needy adventurers from Poland and Russia. He was succeeded as leader of the Nihilists by M. Drogomonov, who resides in Geneva. A few words from a speech made by Bakunin in 1868 may indicate the meaning which he attached to Nihilism: "Our first work must be the destruction and annihilation of everything as it now exists. You must accustom yourselves to destroy everything, the good with the bad, for if but an atom of this old world remains, the new will never be created. According to the priests' fables, in older days a deluge destroyed all mankind, but their God specially saved Noah, in order that the seeds of tyranny and falsehood might be perpetuated in the new world. When *you* once begin your work of destruction, and when the floods of enslaved masses of the people rise and engulf temples and palaces, then take heed that no ark be allowed to rescue any atom of this old world, which we now doom to destruction." (H. L.)

BALANCE OF TRADE, a term used in political economy to designate the relations of exports to imports. Where the former exceed the latter the balance is described generally as favorable; where the imports are in excess, as unfavorable. This definition, however, requires modification, for, as will be shown, the balance may be unfavorable where the exports exceed the imports, and favorable when the reverse of the case. The true definition of an unfavorable balance is that it is one which involves such an export of gold and silver as either reduces the natural supply of those metals below the amount which can be used advantageously at home, or prevents the increase of the supply to that amount.

The opinion that a favorable balance of trade was of paramount importance to national welfare originated in Europe during the prevalence of the mercantile theory of national economy (1492–1776). The vast improvement in all kinds of industry consequent upon the great influx of gold and silver from America led both statesmen and economists to entertain the opinion that the acquisition of a large supply of these metals should be sought by every means. Laws were passed as late as the time of Frederick the Great to prohibit the export of the precious metals. Others put a premium upon the importation and use of foreign coin. The economists generally insisted that the best measure was to sell to other countries a larger amount of commodities than was bought from them, and to take the payment of the balance in coin.

Since Adam Smith's time the English school of economists have treated this view as a palpable absurdity, declaring it a matter of no importance whether a country pays for its purchases entirely in other commodities, or exports for that purpose a part of its supply of the commodity called money. They say, with Turgot, that money is a commodity like every other; that no serious consequences attend a reduction of the supply by export; and that any inequality which thus may be produced will be corrected by the operation of the laws of demand and supply. If there be less gold and silver within the country, the purchasing power of these will increase, and prices of other commodities will fall in exact ratio. The country will become "a good place to buy in, but a bad place to sell in," until it has attracted purchasers and secured the import of coin to such an extent as to raise its supply of coin to the normal level.

This view of the matter, though accepted in substance by nearly all English economists, never has commended itself to the practical judgment of England's business-men. As Prof. Stanley Jevons complains, the money articles in the London newspapers are steeped in the mercantile theory. The acquisition and retention of the supply of gold, so far from being regarded as a matter of indifference, or being left to the control of natural laws, is made a chief point in mercantile and banking policy. The prospect of an export of gold to America is contemplated with anxiety; the likelihood of an import is regarded with unconcealed satisfaction. Something like an international struggle for the possession of this metal has gone on between England and other European countries for many years past; and one of the reasons urged for the remonetization of silver is the hope that this addition to the international supply of money may diminish the necessity for a conflict of this sort.

This unwillingness to treat the balance of trade as of no importance is justified by the history of international trade. We find that the export of coin goes on for years in many countries, to the serious reduction of the supply of available money, without any reverse of the tendency through the operation of the law of supply and demand. Japan, for instance (see ENCYCLOPÆDIA BRITANNICA, Vol. XIII. pp. 589–590 Amer. reprint; p. 580 Edin. edition), has been exporting her supply of bullion ever since the commercial treaties with European countries went into operation. So much of the supply as is found in the seaports, or can be drawn from the rural districts by business transactions, has been sent abroad, and has been replaced by irredeemable paper worth about 50 per cent. of its nominal value. But this has effected no cheapening of commodities in Japan. It has not caused larger purchases from her and fewer sales to her. On the contrary, as money is the instrument of association as well as of exchange, the removal of a supply of trustworthy money has proved a very serious obstacle to the development of Japanese industries, and has contributed to that decline of manufactures which characterizes the industrial situation.

So, again, the United States has made a net export between 1860 and 1880 of no less a sum than $768,391,787 in gold and silver bullion; and although, at times, our supply of coin has been by far too scanty for our uses, there has been no such return of bullion as would be produced by the simple operation of the law of supply and demand.

In fine, the English doctrine as to the unimportance of the balance of trade, while an essential prop to other economic doctrines on which both her practical and her theoretical economists lay great stress, rests upon an inadequate theory of the nature and the functions of money. Money is not "a commodity like any other," because its universal relations to other commodities, and the impossibility of replacing it *ad libitum*, give it a distinct character. If the amount of the rolling-stock on our railroads were limited, and the supply could not be adjusted to the demand, it would be an act of supreme folly to export engines and freight-cars. And the functions of money are somewhat like those of an irreplaceable rolling-stock. Its export tends to retard domestic commerce in every direction, to check industrial association, and to prevent the organization of industry.

It is well objected to the old definition of the balance of trade that many of the most prosperous countries reported imports in excess of exports year after year, and that these countries not only showed no decline in their welfare, but even added to their supply. Mr. Giffen of *The Statist*, in reply to the Fair-Trade party in England, very justly discriminates between a balance really unfavorable and a balance apparently such. He shows that nations which are largely engaged in the carrying trade can afford to take in commodities the pay for the use of their ships, and that the whole amount of the commodities thus imported may be in excess of the exports without being a disadvantage. He also shows that nations which have large investments in foreign countries may receive the interest on these investments in commodities without disturbing the balance of trade. In the opposite case, a country which pays in commodities the interest on investments held by foreigners may export more than it imports, and yet find the balance of trade not in its favor. Hence the great discrepancy between the real and the apparent balance.

It is also true that a country which is a producer of the precious metals may export a part, or even the whole, of its annual product without disturbing the balance. But failure to retain this product of bullion to the full extent of the national demand for circulation would be a disadvantage as serious as an unfavorable balance of trade. (R. E. T.)

BALDWIN, Matthias William (1795–1866) a distinguished Philadelphia machinist and inventor, was born at Elizabethtown, N. J., Dec. 10, 1795. His father, a carriage-maker, died when Matthias was four years of age, and his widow, having lost her property through the mismanagement of the executors, was obliged to support her family of five children by her own exertions. At the age of sixteen Matthias began to learn the jeweller's trade in the suburbs of Philadelphia, and soon became an expert workman. He early developed a taste for the beautiful, and in 1819 began to manufacture ornamental jewelry. When the demand for this work declined, he entered into partnership with David H. Mason to make tools for bookbinders, and in 1822 began to engrave cylinders for calico-printing. This business was soon extended in various directions with uniform success. Besides other inventions, Mr. Baldwin erected a small steam-engine of novel construction to supply the motive-power needed in his increasing business, and this engine continued in use for over fifty years. His success in this work led him to dissolve his partnership and engage in the construction of steam-engines. In 1830, having seen for a short time a locomotive imported by the Camden and Amboy Railroad, he made, with four months' labor, a miniature locomotive which drew two cars with eight passengers, and was exhibited for the first time at Peale's Museum, April 25, 1831. In 1832 he received an order from the Philadelphia and Germantown Railway for a locomotive according to a plan of Col. S. H. Long, U. S. A., which was placed on the road November 23. Though its own weight was limited to five tons, it was able to carry thirty tons at a rate of fifteen miles an hour. According to the advertisement in the daily papers, it ran daily when the weather was fair, but on rainy days horses were attached to the train. In 1835 he removed his shop to the place where the extensive Baldwin Locomotive Works yet remain, giving regular employment to hundreds of men and sending engines to every part of the civilized world. His subsequent career is remarkable for fertility of invention and for steady heroism amid financial difficulties. During all the troubles connected with the panic of 1837 he persevered in experiments and efforts to produce superior engines. His six-wheeled gear locomotive, patented in 1841, was only a partial solution of the problem of carrying heavy freights around sharp curves and up steep grades. The flexible-truck locomotive, by which this was successfully accomplished, was patented August, 1842, and was his most decided triumph in mechanical engineering. Mr. Baldwin took an intelligent interest in public affairs, and in 1837 was a member of the convention to amend the constitution of Pennsylvania, in which he opposed the alterations which restricted the right of suffrage to white citizens and caused the judges to be elected by the people instead of being appointed by the governor. In 1853 he was elected to the State legislature, where he discharged his duties with honesty and fidelity. In 1831 he became a member of the Presbyterian church under Rev. Albert Barnes, and in the latter part of his life, foreseeing the rapid growth of Philadelphia, contributed liberally to the erection of churches in various parts of the city. His large income was almost entirely spent for benevolent and religious purposes. He devoted much attention to horticulture and the fine arts, and took delight in affording to the public a display of the beauties of his conservatory. He died at Philadelphia, Sept. 7, 1866.

BALDWINSVILLE, a village of Onondaga co., N. Y., is on the Seneca River, 23 miles S. E. of Oswego, on the Oswego and Syracuse Railroad. It has a national bank, a State bank, a weekly newspaper, four hotels, a town-hall, an opera-house, an academy, and several churches. The river furnishes good water-power; there are five large flouring-mills, a foundry, a woollen-factory, manufactories of forks, hoes, rakes, centrifugal pumps, wagons, and carriages. It is the emporium of the tobacco district of Central New York, $1,000,000 being spent annually on this crop. It was incorporated in 1848. Population, 2121.

BALFOUR, Francis Maitland (1851–1882), an English embryologist, was born in 1851. While studying at Harrow he directed his attention to natural science, and after entering Trinity College, Cambridge, in 1870, devoted himself especially to original research in embryology. While an undergraduate he published some articles which gave him a high reputation, and on taking his degree in 1873 he went to Naples, where he pursued his special studies with great success. In 1874, in conjunction with Dr. M. Foster, he published *Elements of Embryology*, a masterly work, and in the same year read before the British Association a valuable paper on the "Development of Elasmobranch Fishes." In October, 1874, he was elected to the natural science fellowship of this college, and began to lecture on his favorite studies. In 1878 he was made a fellow of the Royal Society, and in 1881 was placed in its council. In the same year he received the degree of LL.D. from the University of Glasgow. He had refused several calls to important positions elsewhere, and in 1881 a special professorship of animal morphology was created at Cambridge in order to retain his services. In 1882 he went to spend the summer in Alpine-climbing, but was killed by a fall on Mont Blanc, July 19, 1882. His principal work is *Comparative Embryology* (1880–81), which gives a complete and lucid summary of all that had been accomplished in that new branch of science to the date of its publication, and also indicates the direction in which future investigations should be pursued.

BALFOUR, JOHN HUTTON, F. R. S., an eminent Scotch botanist, was born at Edinburgh, Scotland, Sept. 15, 1808. His father was a surgeon in the British army, and related to Dr. James Hutton, the author of the famous Huttonian theory of the earth. Young Balfour began to attend school at the age of four, and was a pupil in the High School of Edinburgh at seven. After spending six years here, he studied for three years at the University of Edinburgh, and for one at the University of St. Andrews. Having completed his collegiate course with high honor, he began to study divinity, but his attention was soon directed to botany, of which his father had been very fond. Mr. Balfour began the special study of this branch in 1826 under Prof. Graham, and made his first botanical excursion in 1827 in Sutherlandshire, where his party met Sedgwick and Murchison studying the geology of that wild part of Scotland. His passion for botany led him to commence also a course of medical study. He passed the Edinburgh College of Surgeons in 1831, and received the degree of M. D. from the University of Edinburgh in 1832. After beginning practice in his native city, he visited Paris for the purpose of extending his medical knowledge under Dupuytren and other eminent instructors. Having settled down in his profession, he became highly successful, but still devoted his leisure time to the study of botany. In 1836 he assisted in establishing the Botanical Society of Edinburgh, and in 1840 instituted a course of lectures on his favorite subject. In 1841 he was chosen professor of botany in the University of Glasgow, and removed to that city, entirely relinquishing medical practice. After holding this position with great credit four years, he was recalled to his native city to succeed his former preceptor. His class has steadily increased from 160 in 1846 to 400. He was also in 1845 appointed Regius keeper of the Royal Botanic Garden and queen's botanist for Scotland. Under his management extensive improvements and additions have been made in the gardens, buildings, rooms, and library. He has also made many botanical excursions in company with his students in Scotland, Cumberland, Wales, and Switzerland. One of his Highland rambles has been made famous by a spirited poem called "The Battle of Glen Tilt," by Douglas Maclagan. For thirty years Prof. Balfour has been dean of the medical faculty of the University of Edinburgh, and for fifteen years the secretary of the Royal Society of Edinburgh. Besides contributing to periodicals and the *Transactions* of the Royal and other societies, he edited in part, from 1842 to 1857, the *Annals of Natural History*, and from 1855 to 1866 the *Edinburgh New Philosophical Journal*. He has also written a *Manual of Botany, Botany and Religion, Class-book of Botany, The Plants of Scripture*, and some text-books for schools, as *The Elements of Botany, First and Second Books of Botany. The Botanist's Companion* (1860) contains instructions for the use of the microscope and directions for collecting and drying plants. His *Catalogue of British Plants* was issued in 1865; he has also prepared *Colored Botanical Illustrations, with Hand-book.* He has contributed the article on "Botany" to the eighth and ninth editions of the *Encyclopædia Britannica.* By his lectures, books, and other publications Prof. Balfour has done much to extend and encourage the study of botany among all classes. His sons share in their father's zeal and follow in his footsteps, the eldest, a lieutenant in the British navy, having taken part in the scientific voyage round the world in H. M. S. Challenger, and the second, who is now professor of botany in the University of Glasgow, having visited the islands of Rodriguez and Socotra and made important additions to botanical knowledge.

BALL, THOMAS, an American sculptor, was born at Charlestown, Mass., in June, 1819. He commenced as a portrait-painter, and met with some success. Afterwards he decided to take up sculpture, and modelled busts of Jenny Lind, Daniel Webster, and other celebrities, which were admired. During a somewhat prolonged residence in Europe, whither he went for purposes of study and practice, Ball modelled a number of works, including his Truth, Pandora, and the Shipwrecked Sailor. On his return to the United States he made an equestrian statue of Washington for the city of Boston, and many portrait-busts and other minor performances. Of his sculptures of this period his statuettes of Clay and Webster and his bust of Rufus Choate are perhaps the most important. In 1865, Ball became a resident of Florence, and there modelled his statue of Edwin Forrest as Coriolanus, a statue of Eve, a bust of Edward Everett for the Boston Public Library, a statue of Webster for Central Park, New York, a group entitled Emancipation for Washington, D. C., and other works.

BALLOU, HOSEA, 1st (1778–1852), an American Universalist minister, was born at Richmond, N. H., April 30, 1771, the son of a Baptist preacher. He acquired an education under great difficulties. Having adopted Universalist views, he was expelled from the Baptist Church; was pastor of a congregation at Dana, Mass., 1794–1802; at Barnard, Vt., 1802–07; at Portsmouth, N. H., 1807–15; at Salem, Mass, 1815–17; at Boston, 1817–52. He died at Boston, June 7, 1852. In 1819 he founded the *Universalist Magazine*, and in 1831 the *Universalist Expositor*, a quarterly. He was author of *Notes on the Parables* (1804); *A Treatise on the Atonement* (1804); some volumes of sermons; a volume of poems and original hymns; and several polemical works. See his *Life*, by Whittemore (1854), and that by his son, M. M. Ballou (1860). He was one of the principal founders of the modern school of American Universalism.

BALLOU, HOSEA (1796–1861), a Universalist minister, grand-nephew of Hosea Ballou first, was born at Halifax, Vt., Oct. 18, 1796. In 1815 he was installed pastor at Stafford, Conn., and afterwards served at Roxbury and Medford, Mass. In 1822 he became one of the editors of the *Universalist Magazine*, and in 1832 he joined with his uncle in establishing the *Universalist Expositor*, afterwards called the *Universalist Quarterly.* His principal work is *The Ancient History of Universalism*, 1829; he also edited Sismondi's *History of the Crusades*, 1833, and a collection of Psalms and Hymns. In 1853 he was elected president of Tufts College, Somerville, Mass., and visited Europe to examine the various systems of education, returning in 1855 to enter upon his duties, which he discharged till his death, May 27, 1861.

BALL'S BLUFF, a bank or bluff on the Virginia side of the Potomac, 32 miles N. W. of Washington, the scene of a disaster to the Federal troops in the Civil War, Oct. 22, 1861. The armies lay opposite each other on either side of the river, and Gen. McClellan ordered a reconnoissance to be made by Gen. McCall, in pursuance of which this officer occupied Dranesville without resistance on the 19th.

The Federal general Stone was at Poolesville, watching the road to Leesburg, and was also directed by Gen. McClellan to make a slight demonstration to feel the enemy. He was to display an intention to cross, but was not expected to cross in force. Stone ordered Col. Devens to bring two flatboats from the Ohio and Chesapeake Canal into the river opposite Harrison's Island, which divides the stream at that point. This done, he sent a detachment over to the Virginia shore, where they expected to find a small camp of the Confederates: the landing was made opposite the island at Ball's Bluff, which varies in height from 50 to 150 feet. The detachment, 650 strong, set out at midnight, over wet and slippery ground, in the direction of Leesburg, and, encountering no enemy, the commander sent back for orders. He was soon aware, however, of masses of Confederate cavalry on his flanks and trying to surround him, and therefore fell back precipitately to the bluff. There he found reinforcements just arrived under Col. E. D. Baker, who was the ranking officer. The force was now 1900 strong, and there was no alternative but to fight: they could not retreat; there were only two boats, and but one of them was at the landing. The enemy overwhelmed them with numbers: there was great carnage: Baker was killed. One boat was at the island; the remaining one was swamped. Many who attempted to save themselves by swimming were drowned or shot, and Col. Cogswell was captured and taken to the Libby prison, in Richmond, where he was held as a hostage for the Confederate privateers. The Federal losses were 300 shot and drowned, 700 wounded and captured. A small force which was ordered up from Edwards's Ferry to support the movement arrived too late to avert the disaster. (H. C.)

BALLSTON SPA, the county-seat of Saratoga co., N. Y., is on the Rensselaer and Saratoga Railroad, 31 miles N. of Albany and 6 miles S. W. of Saratoga Springs. It is noted for its acidulous chalybeate springs, which rise from the Hudson River shales. They were discovered in 1769, and were pronounced highly medicinal. In 1792 a log house was built for the accommodation of visitors, whose numbers soon increased when the waters were analyzed by Dr. Valentine Seaman of New York and others. In 1804, Nicholas Low, a New York merchant, built here the Sans Souci Hotel, then the finest in the United States, and for thirty years the summer resort of fashionable and distinguished men. The waters then disappeared from all but two of the springs, but within a few years five new fountains have been opened by boring, the deepest being 800 feet, and its waters are shown by analysis to be superior to any previously discovered at this place. The village has nine hotels, two national banks, a court-house, a fine almshouse, five churches, two schools, and two weekly newspapers. The Kayaderosseras River, passing through the village, affords valuable water-power, which is used in the manufacture of axes, scythes, cotton and woollen goods, paper, sash, and blinds. Population, 3011.

See Vol. III. p. 257 Am. ed. (p. 298 Edin. ed.).

BALTIMORE, the metropolis of Maryland, is the seventh city in the United States in respect of population, the fifth in commercial importance, and the eighth in amount of manufactures. It is situated on the N. side of the Patapsco River, 14 miles from Chesapeake Bay, 38 miles N. E. of Washington, and 97 miles S. W. of Philadelphia; lat. 39° 17′ N. and long. 76° 37′ W. A townsite of 60 acres was here laid out in 1730, and received its name from Cæcilius Calvert, Lord Baltimore. To this a settlement on the other side of Jones's Creek was added in 1745, and further additions were afterwards made. Yet its early growth was slow; in 1752 it contained only 25 houses and 200 inhabitants, while its entire shipping was a brig and a sloop. The Acadian exiles who arrived in 1756 contributed by their industry and frugality to the material prosperity of the place. In 1767, Baltimore became the county-seat of Baltimore county, and in the following year means were provided for the erection of a court-house and prison; this old court-house was removed in 1808. At the outbreak of the Revolutionary War, Baltimore had increased to a town of about 600 houses and 6000 inhabitants. During the war the people contributed their quota of men and money to the American army, and Congress, when driven from Philadelphia, for a short time held its sessions here. It was not until 1780 that Baltimore was made a port of entry and had a custom-house, entrances and clearances being formerly made at Annapolis. Many enterprising merchants, most of them Scotch-Irish, then settled in Baltimore and gave great impetus to its commerce. The harbor was improved, and better means of communication with the rest of the country established. In 1792 many persons fleeing from the massacre of San Domingo took refuge in Baltimore and contributed to its prosperity. In 1796 the town, having a population of 20,000, was raised to the rank of a city, with a mayor and city council. Its commerce continued to increase until the War of 1812, when the harbor was almost constantly blockaded by a British squadron, though the merchants revenged themselves by sending out privateers which did great damage to British shipping. At the close of the war commerce was renewed and prosperity returned. The building of the Baltimore and Ohio Railroad in 1832 greatly contributed to the increase of business. On April 19, 1861, soldiers of Massachusetts and Pennsylvania regiments, while marching through Baltimore on their way to the defence of Washington, were attacked by a mob, and several soldiers and citizens were killed and wounded. Communication with the city was suspended for some time, but on May 13 Gen. B. F. Butler took military possession of Baltimore. In a brief period tranquillity was restored, but the business of the city suffered greatly during the war. On July 25, 1873, occurred the greatest fire by which Baltimore has been afflicted. Of the 113 buildings which were consumed, 2 were churches and the rest chiefly dwellings. The loss was estimated at $750,000. Since that time the city has grown steadily in population, wealth, and commercial importance. The following table shows the population of Baltimore by the several U. S. censuses:

Year.	Population.	Year.	Population.
1790	13,503	1840	102,313
1800	26,514	1850	169,054
1810	35,538	1860	212,218
1820	62,738	1870	267,354
1830	80,625	1880	332,313

In the last-named year 278,584 were whites and 53,716 colored; 276,177 were of native birth and 56,136 foreign. The police registration of voters in May, 1882, showed a total of 81,704, of whom 11,924 were colored. In 1882 the deaths were 8702, the births 7730, and the marriages 3760. The total bonded debt of the city in 1880 was $20,184,975, but as there was a sinking fund of $19,330,509, the net debt was only $854,466. Since 1880 the tax-rate for both city and State purposes is $1.55¾ on every $100 of valuation.

Six railroad lines centre in Baltimore—the Baltimore and Ohio, the Baltimore and Potomac, the Philadelphia, Wilmington, and Baltimore, the Northern Central, the Maryland Central, and the Western Maryland. The corner-stone of the Baltimore and Ohio Railroad was laid on July 4, 1828, by the venerable Charles Carroll of Carrollton, the last surviving signer of the Declaration of Independence. In 1830, Peter Cooper drove the first engine which passed over the road. The trip was to Ellicott City, 15 miles distant. This was the first passenger locomotive that had ever passed over a railroad in the United States. The Baltimore and Ohio is now one of the great trunk-lines of the country, with branches extending south, west, and north-west. On the Baltimore and Potomac Railroad is a tunnel, 1½ miles long, which passes through the city from its western side to tide-water at Canton. There are several open cuts at intervals; the length of the tunnel proper is 6969 feet, its width 27 feet, and the arch is 22 feet high. The total cost of construction was $2,300,000.

Baltimore was the first city in the Union lighted by gas, and the first that introduced a paid fire department. The first electric telegraph in this country was built between Baltimore and Washington in 1844.

Baltimore was formerly the greatest flour-market of the United States, and, though it has lost its precedence, its grain-trade is still extensive and valuable. In 1882 the receipts of wheat were 18,405,321 bushels; of Indian corn, 2,642,872 bushels; of flour, 1,299,988 barrels; and of other cereals, 1,415,911 bushels. The exports of wheat in 1882 were 16,872,416 bushels; of Indian corn, 1,067,250 bushels; of flour, 338,430 barrels and 109,173 sacks. One of the finest buildings recently erected in the city is the Chamber of Commerce for the use of the members of the Corn and Flour Exchange. It occupies more than 16,000 square feet of ground and is built of granite, bricks, and iron, being intended to be fire-proof. The railroad grain-elevators of the city have a total capacity of 6,150,000 bushels, and there are four floating elevators with a capacity of from 2000 to 6000 bushels per hour. Baltimore has an extensive trade in canned oysters, fruit, and vegetables, and the operators in this business have recently formed an exchange for their special benefit. They send their goods to the West Indies, South America, and Europe, the total export in 1882 being 20,191 cases. The other principal exports are petroleum, tobacco, cotton, hams, lard, tallow, cattle, naval stores, and coal. The total value of exports in 1881 was $55,687,745. The principal imports are iron, steel, tin-plate, coffee, sugar, molasses, agricultural salts, and chemicals. The total value of imports in 1881 was $16,255,495. The entrances at the port of Baltimore in 1882 were 797 vessels, whose tonnage amounted to 795,727; the total clearances were 792 vessels, with a tonnage of 782,919.

In the extent of its manufactures Baltimore is the eighth city of the Union, coming next to Cincinnati. The following statistics from the census report of 1880 show the extent of the manufactures both in the city and in the city and county of Baltimore combined:

	City.	City and county.
Number of establishments......	3,683	4,130
Number of persons employed...	56,338	62,048
Capital..................................	$38,586,773	$46,245,343
Annual wages.........................	15,117,489	16,609,228
Value of material....................	47,974,294	55,664,853
Value of product......................	78,417,304	89,583,147

The libraries and literary institutions of Baltimore are numerous and important. The Peabody Institute, founded by the eminent banker and merchant George Peabody, has a library containing 80,000 volumes, and its building is architecturally one of the finest in the world. It is intended chiefly for scholars, and will be supplemented by the Enoch Pratt Free Circulating Library, recently endowed by the eminent merchant whose name it bears with $1,250,000. The Mercantile Library contains 38,000 volumes, representing all the popular branches of literature. Besides these there are the Maryland Historical Society's Library, 22,000; the City Library; Loyola College Library; the library of the Young Men's Christian Association; the Bar Library, 8800; the Medical and Chirurgical Library, 3300; the Whittingham Library, 17,000 volumes, chiefly theological, formed by the late Bishop Whittingham of the Episcopal Church; the library of the Mechanics' Institute; the library of St. Sulpice; and others. The Johns Hopkins University, endowed with the munificent gift of $3,500,000 by the wealthy merchant whose name it bears, was opened on Sept. 13, 1876, in temporary quarters on North Howard Street. Its faculty includes the president, Daniel C. Gilman, and an academic staff of 40, divided as follows: 6 full professors, 16 associate professors, 9 lecturers, 9 instructors and assistants in the laboratories, and 19 fellows; the number of students for the session of 1883 was 204. During the winter from November to March, inclusive, lectures on literary, scientific, and historical subjects are given, to which the public are admitted by cards. Its library contains 14,000 volumes. Loyola College, established in 1852 under the charge of the Society of Jesus, was raised to the rank of a university by the legislature of Maryland in 1854. The studies embrace a full classical and mathematical course occupying six years, at the end of which degrees are conferred. Baltimore has three schools of medicine—viz., the University of Maryland, College of Physicians and Surgeons, and the Washington Medical College. The two last have been opened since the Civil War. The University of Maryland is one of the oldest medical schools in the United States, having been established in 1812, and during the period of its existence it has sent forth 7500 alumni. The Maryland Academy of Science and the Law School of Maryland are institutions of comparatively recent establishment. The present public-school system of Baltimore was begun in 1829. From a very small beginning it has increased until the number of schools is now 121, including the Baltimore City College, 2 female high schools, 19 male grammar schools, 20 female grammar schools, 30 male primary schools, 30 female primary schools, 5 public (formerly English-German) schools, and 14 colored schools. The number of pupils during the year 1882 was 48,277; teachers, 826, of whom 84 were males and 742 were females; expenses, $630,000. The Baltimore City College is intended for pupils of the public schools who desire a higher education than is furnished by the grammar schools. The course of studies includes the ancient classics, mathematics, philosophy both moral and natural, and the modern languages. The number of students now attending is 600, the number of professors 14. Graduates from the Baltimore City College are admitted into the Johns Hopkins University as fellows and post-graduate students.

Baltimore is well supplied with churches, there being 240 congregations, most of which have buildings for worship. The principal religious denominations have the following numbers: Baptists, 18; Lutheran, 20; Methodist Episcopal, 47; Methodist Episcopal, South, 8; Methodist Protestant, 9; African Methodist, 5; Presbyterian, 28; Protestant Episcopal, 35; Reformed Episcopal, 4; Reformed, 6; United Brethren, 5; Roman Catholic, 28; Jewish synagogues, 8. The Roman Catholic cathedral is the largest and most impressive; it is built in the form of a cross, with a dome and towers. The architectural appearance of many of the churches is fine; some of them are built of Baltimore county marble.

Baltimore is called the "Monumental City," and first obtained this name from the monument to Washington erected upon ground given by Col. John Eager Howard for that purpose in 1815. The monument is a white marble column 160 feet high, modelled after the Vendôme Column in Paris. The top is crowned by a colossal statue of Washington. The monument stands upon an eminence where Mount Vernon Place and Washington Place meet, and is surrounded by some of the most stately private residences of the city. Other monuments since erected continue to justify the claim of the city to its title. The Battle Monument, on North Calvert Street, was erected in memory of the citizen soldiers who fell in defence of Baltimore at the battle of North Point and bombardment of Fort McHenry, Sept. 12–13, 1814. It is 52 feet high, and the shaft is crowned by a female figure emblematic of the city of Baltimore. The Wells and McComas monument, in Ashland Square, was erected to the memory of two Baltimore riflemen who sacrificed their lives at North Point. The Wildey monument, on Broadway, erected by the Odd Fellows of Maryland, is in memory of Thomas Wildey, who introduced the order into the United States. The monument is a Grecian Doric column 52 feet in height and surmounted by figures of a woman and children. The monument to Edgar A. Poe, in Westminster churchyard, corner of Fayette and Greene Streets, is simply a pedestal with an ornamental cap, wholly of marble, resting on two marble slabs and a granite base. A medallion portrait of the poet is chiselled on one side of the pedestal, and his name and date of his birth and death on the other. It was built by money raised by the public-school teachers of Baltimore, assisted by a liberal gift from George W. Childs of Philadelphia, a native of Baltimore.

Baltimore has been the birthplace of several clever artists, and many of its citizens have displayed a cultured taste for the fine arts. There are two public galleries—the Peabody and that of the Maryland Historical Society. The former has a very meagre collection of paintings, but is rich in sculpture, including Clytie and other works of Rinehart, and casts of the most famous statues of antiquity. The Maryland Historical Society's gallery contains portraits of several Maryland worthies and American heroes, together with a fine collection of original paintings by the modern school and copies of celebrated masterpieces. It has also a small but interesting group of casts representing the choicest works of the French and Italian galleries.

There are three principal places of amusement in Baltimore, of which the Academy of Music is the largest and most splendid. It was built at a cost of $400,000, and will seat 2000. It is elegantly finished and decorated, its acoustic qualities are perfect, and it is lighted by electricity. It was opened Jan. 5, 1875. Ford's Grand Opera-house is the next largest place of public amusement in the city. The Holliday Street Theatre occupies a site which has been devoted to the dramatic art for a hundred years. Here Washington, La Fayette, and other heroes of the Revolution witnessed a dramatic entertainment when passing through the city after the surrender at Yorktown, and the "Star-Spangled Banner" was first sung from the stage of the old Holliday Street a few days after the bombardment of Fort McHenry.

One of the most magnificent collections of buildings in this country will be the Johns Hopkins hospitals on Broadway, now approaching completion, intended for white and colored patients, and endowed with $3,500,000. The hospitals will be opened on Oct. 1, 1885. The new post-office, now in process of erection on the square bounded by Fayette, Lexington, Calvert, and North Streets, will be one of the most imposing public buildings in the United States. It is 152 feet in front and 234 feet deep, and will be four stories high; the third story will be used for the United States courts.

Baltimore is well supplied with parks and squares, the largest and most beautiful of which is Druid Hill Park, just beyond the north-western boundary of the city. It was opened to the public Oct. 19, 1860. The original tract was 450 acres, and additions have been made from time to time until the area now amounts to 693 acres. In natural scenery it is unsurpassed by any park in this country, and includes a great variety of forest trees as well as mossy dells, woodland glens, limpid streams, crystal springs, sparkling fountains, velvety lawns, and beautiful lakes and drives. The expense of purchasing and keeping the park in order has been paid out of a tax imposed upon the city passenger railways of one cent for every passenger they carry. Patterson Park, in the south-eastern section of the city, was originally composed of 56 acres, the gift of William Patterson, a Baltimore merchant. In 1882, by a vote of the people, an appropriation of $200,000 was made for enlarging and beautifying this park. (E. L. D.)

BAMBERGER, Ludwig, a German statesman and political economist, was born at Mayence, June 22, 1823. He studied law at Giessen, Heidelberg, and Göttingen, and practised for two years in his native city. He had just passed the state examination when the Revolution of 1848 began. As editor of a leading journal he strongly advocated the movement toward an imperial constitution, and on the failure of the revolution fled to Switzerland. Meantime his trial proceeded at Mayence, and he was condemned to imprisonment, and afterwards to death. From Switzerland he went to England, and thence to Belgium and Holland, engaging in mercantile pursuits. Finally, he settled in Paris in 1853, and became the manager of a large banking-house. During his exile he published some treatises on financial and economic subjects, as well as a sketch of Bismarck. After the German War of 1866 he returned to Mayence, and in 1868 was elected to the German customs-parliament, in which he was the leader of the free-trade party. In August, 1870, after the outbreak of the Franco-German War, Bamberger was invited by Count Bismarck to the headquarters of the army, and his intimate acquaintance with French affairs enabled him to render important service to the German cause. Afterwards he assisted the governor of Alsace in regulating the affairs of that province in its new relations. In 1871 he was elected to the imperial parliament, and soon became one of the leaders of the National-Liberal party. His wide personal experience, as well as the force and clearness of his statements, gave him a high rank as a speaker on financial subjects. His work *Die Arbeiterfrage unter dem Gesichtspunkt des Vereinsrechts* (1873), as well as numerous speeches, testified his interest in the labor question and other social issues. In 1878 he endeavored to unite practical and theoretical work in behalf of free trade by forming an association for its promotion. In 1880 he abandoned the National-Liberal party, because the majority under Bennigsen would not break finally with Prince Bismarck after the adoption of the protective tariff of July 13, 1879, and with some prominent associates he went into what was called "the Secession." The reasons for this movement he explained in his pamphlet *Die Secession* (1881). After the next parliamentary elections he assisted in forming a new combination called "the Liberal Union," for the purpose of combining the various activities of the Liberal party. Besides the works and pamphlets already mentioned his chief publications are *Vertrauliche Briefe* (1870), *Die Aufhebung des indirekten Gemeindeabgaben* (1871), *Die Zettlebank* (1874), *Reichsgold* (1876), *Deutschland und der Socialismus* (1878).

BANCROFT, George, an American historian and statesman, was born at Worcester, Mass., Oct. 3, 1800. He is the son of Rev. Aaron Bancroft (1755–1840), Congregational (Unitarian) minister of that place for more than fifty years, and author of a *Life of Washington*. George, who was one of a numerous family, was educated at Exeter, N. H., under Dr. Abbott, who saw that he had "the stamina of a distinguished man." In 1813 he entered Harvard College, and, graduating with high honor in 1817, went the following year to Germany to pursue his studies. Receiving his degree as doctor of philosophy at Göttingen in 1820, Mr. Bancroft visited Berlin, and made an extensive tour in Germany, Switzerland, Italy, and England, enjoying personal acquaintance with many of the most distinguished men of the period in those countries. He returned to America in 1822, and was for a year tutor of Greek at Harvard College. He had been designed for the ministry, and preached some sermons, but abandoned that profession for the pursuit of letters. In 1823 he published at Boston a volume of poems, and contributed from time to time to the *North American Review* and to the *American Quarterly Review* translations of the minor poems of Goethe, Schiller, and others, as well as several interesting and striking articles, which at a later period (1855) were collected and republished in a volume of *Miscellanies*. About this time, in conjunction with Dr. J. G. Cogswell, subsequently the superintendent of the Astor Library, Mr. Bancroft opened the Round Hill School at Northampton, Mass., noted for its scholarly influence, and of which the historian Motley was among others a pupil. A translation of Heeren's *Politics of Ancient Greece*, also of Heeren's histories of *The States of Antiquity* and of *The Political System of Europe and its Colonies from the Discovery of America to the Successful Termination of the Struggle for Freedom of the British Colonies*, were among the fruits of his leisure at this period. Mr. Bancroft's most enduring fame will rest upon his *History of the United States from the Discovery of the American Continent*, of which the first volume appeared in 1834. "It struck a new vein in American history, original in design and conception. It took the subject out of the hands of mere annalists and commentators and raised it to the dignity and interest of philosophical narration. The original preface stamped the character of the work in its leading motives, the author's sense of its importance, and his reliance on the energetic industry which was to accomplish it. The picturesque account of the colonial period gave the public the first impression of the author's vivid narrative, while the tribute to Roger Williams was an indication of the allegiance to the principles of liberty which was to characterize the work" (*Duyckink*).

The first three volumes, embracing "The History of the Colonization of the United States," were published respectively in 1834, in 1837, and in 1840.

Mr. Bancroft had early associated himself with the Democratic party, and was in the lecture-room and on the stump a frequent and earnest advocate of its principles. In January, 1838, he was appointed by Pres. Van Buren collector of the port of Boston, an office which he held until the accession of Harrison in 1841, discharging its duties with marked energy and fidelity. In 1844 he was the Democratic candidate for governor of Massachusetts, but was not elected. In March of the following year he was called by Pres. Polk to a seat in his cabinet as Secretary of the Navy, a position which he held until September, 1846. His brief tenure of the Navy Department was signalized by several needed reforms, and especially by two important additions to its usefulness—the Naval School at Annapolis and the astronomical observatory at Washington.

Mr. Bancroft resigned his seat in the cabinet to accept the appointment of minister plenipotentiary to Great Britain, where he remained until the summer of 1849. His residence in London, apart from the distinguished post he occupied as his country's representative, derived yet further lustre from the intimate association into which he was called with the eminent men of letters and statesmen of the day. Of such were Hallam, Macaulay, Milman, Grote, Rogers, Dickens, Whewell, Peel, and Brougham, in England, and in France Guizot, Mignet, Lamartine, De Tocqueville, and others. The historian did not fail to avail himself of the rare opportunities which his public and private relations afforded for enriching his store of documents upon American history. The public archives in England and France were thrown open to him, and many private collections of manuscripts were placed at his disposal.

Upon his return to America, Mr. Bancroft made New York his place of residence, and resumed active work upon his history. In 1852 was published vol. iv., which was rapidly followed by vol. v. in 1853, and by vol. vi. in 1854. At this time the earlier volumes of the history had reached their 15th edition. It had become established as the standard work upon the subject, and had placed its author among the highest in the ranks of historians. Mr. Bancroft's application to his life-work was at this time, as well as before and subsequently, not unfrequently interrupted by the necessity of yielding sometimes to constant demands made upon him for occasional efforts of various sorts. In 1842 he made at Boston an address in memory of Channing. In 1845, upon the death of Andrew Jackson, he was selected to deliver at Washington the commemorative oration. In 1852, before the Historical Society of New York, he delivered a lecture on "The Culture, the Support, and the Object of Art in a Republic," and one in 1853 before the Mechanics' Institute of that city on "The Office, Appropriate Culture, and Duty of the Mechanic." His most brilliant effort in this line was perhaps his discourse before the New York Historical Society at the celebration of its fiftieth anniversary on "The Necessity, the Reality, and the Promise of the Progress of the Human Race." In October, 1855, he made a brief address at the celebration of the battle of King's Mountain in South Carolina. In 1859 he pronounced before the Historical Society in New York a commemorative discourse upon his friend the historian Prescott, and in the following December the death of Washington Irving called forth from him a like tribute before the same body. On September 10th he delivered the oration at the unveiling of the statue of Oliver Hazard Perry, at Cleveland, Ohio. At the obsequies held in New York upon the passage of the remains of Pres. Lincoln through that city after the assassination in April, 1865, Mr. Bancroft, by request of the municipal government, delivered the eulogy. In February following, by invitation of Congress, and in the presence of that body and of the assembled officers of the Government, he pronounced an oration upon the life and services of Abraham Lincoln in the House of Representatives at Washington.

The publication of the history had been resumed in 1858, when the 7th volume appeared. It was followed in 1860 by the 8th volume, bringing the recital down to the Declaration of Independence. It may well be believed that the clash of intestine war, and the threatened disruption of that Union the story of which Mr. Bancroft had made it his life-purpose to relate, were little calculated to stimulate enthusiasm in prosecuting his task. The Muse of History might well pause in bewilderment, uncertain what next she might have to record. We need not wonder, then, that the next volume was delayed until 1866.

In the summer of 1867, Mr. Bancroft received the appointment of minister plenipotentiary at Berlin. The kingdom of Prussia at this time, as a result of the successful war of the previous year with Austria, had formed with the lesser states of North Germany the North German Confederation, and to it the new envoy was also accredited. Mr. Bancroft at once applied himself to the settlement of an international question which for three-quarters of a century had been an unceasing source of discord between the United States and Germany as well as other European powers. On Feb. 22, 1868, six months after his arrival at Berlin, a treaty was concluded by him with the North German Confederation, mutually recognizing the right of expatriation and naturalization. Treaties to like effect were during the ensuing summer concluded by Mr. Bancroft with the remaining (then separate) powers of Germany—viz., Bavaria, Baden, Würtemberg, and Hesse-Darmstadt. The conclusion of these treaties was at once followed by the adoption of similar conventions between the United States and nearly every other civilized nation concerned, thus setting at rest the question perhaps the most serious and the most contested which has ever engaged our diplomacy. The recognition by the concurrent voice of so many nations of the right of expatriation and naturalization has had the effect of establishing that right as a principle of international law.

Upon the consolidation in 1871 of all the states of Germany into the German empire, Mr. Bancroft was accredited to the imperial Government. By the Treaty of Washington the long-existing dispute between the United States and Great Britain as to the line of their water-boundary in the North-west was in 1872 referred to the arbitration of the German emperor. The decision of the umpire in favor of the United States followed the able and exhaustive presentation of their case by Mr. Bancroft, thus securing to the United States the islands of San Juan and adjacent waters.

During his residence of seven years at Berlin, Mr. Bancroft won for himself in a very unusual degree the good opinion of all classes throughout Germany. In 1868 the University of Bonn at its semi-centennial celebration conferred upon him the honorary degree of doctor of laws; and other distinguished marks of appreciation were given him by scholars, especially in 1870, on the fiftieth anniversary of his Göttingen doctorate, on which occasion the emperor made him the unusual gift of his full-size portrait in oil, with the inscription carved upon its frame, "The emperor William I. to his friend George Bancroft, in remembrance of the years 1867–74."

Upon returning to the United States in 1874, Mr. Bancroft established himself at Washington, and in the same year published the tenth volume of his history, which brought the narrative to the treaty of peace of 1782. In the succeeding years Mr. Bancroft devoted himself wholly, in continuation of his great work, to the preparation of the *History of the Formation of the Constitution*, which appeared in two volumes in the spring of 1882. With the indefatigable love of labor which distinguishes him, the venerable historian had scarcely taken his hand from the concluding page of these last volumes before he turned with impatience to begin the task of a thorough revision of the entire work. This he is now (1883) still engaged upon, having published in this year two volumes of the revised edition.

Mr. Bancroft's hours of relaxation have been for many years devoted to the enthusiastic culture of the rose, of which his collection, both at Washington and at his summer residence at Newport, R. I., surpasses probably in number of varieties and perfection of specimens any other private collection in the country.

BANCROFT, HUBERT HOWE, the historian of the American Pacific coast, was born at Granville, Ohio, in 1832. Born of New England parents, he was in early youth obliged to work on the farm, attending school in the winter. In his sixteenth year he went to Buffalo, where he entered a bookseller's store. In 1852 he was sent to California to open a store, but the death of his patron disconcerted his plans, so that it was not till 1856 that he began business in San Francisco. By diligence, energy, and perseverance he succeeded in placing his establishment among the foremost on the Pacific coast. While thus engaged he saw with regret that valuable information relating to California history was lost daily, and began to make efforts to preserve it. Gathering at first books and pamphlets on this subject, he gradually extended his field of research till the western half of North America was included. To these self-appointed labors he devoted time, energy, and wealth; he made journeys to the Eastern States and to Europe to secure additions to his valuable and rapidly increasing collections. When, in 1868, his library numbered 12,000 volumes, Mr. Bancroft felt a strong impulse to prepare some historical work for the purpose of making the treasures he had gathered more readily available to the world. He therefore gave over the active management of his business to his brother, though still retaining an interest in it. He arranged his library in an upper story of their building, and as he secured competent assistants carefully indexed the whole, so as to facilitate his work. In fifteen years, besides the cost of the library itself, he spent not less than $300,000 on labor connected with his researches. A description of the library as it appeared in 1878 may be found in *The Libraries of California*, by F. H. Apponyi. In 1881, Mr. Bancroft erected a special library building 40 by 60 feet and two stories in height. Here he has placed not less than 35,000 books, maps, and manuscripts relating to the Pacific coast, besides 400 files of newspapers. This library, unique in its origin, its purpose, and its arrangement, contains, besides standard authorities, many bibliographic curiosities. There are 1200 volumes of manuscripts, including many records of Mexican affairs in the sixteenth century, the public archives of California and its chief towns, and narratives of early settlers. The Bancroft library is still growing at the rate of 1000 volumes yearly. Mr. Bancroft's original intention when engaging in authorship was to prepare an encyclopædia of the Pacific coast, but he afterwards decided to adopt the historical form, and as a proper introduction was led to prepare his work on *The Native Races of the Pacific States*. The five octavo volumes on this subject, when published in 1875, took the literary and scientific world by surprise. The magnitude, the enormous research, the accuracy of the statements, and the gracefulness of the style obtained universal praise. The author next proceeded with his *History of the Pacific States*, from Central America to Alaska, the first volume of which appeared in 1882. Besides these, his principal works, he has in the *California Pastoral* sketched in more detail the times of the Spanish missions, and in *California Inter-Pocula* the time of the gold discoveries. In another volume, called *Popular Tribunals*, he has recorded the doings of the Vigilance Committees called into existence by early lawlessness. In his *Literary Industries* he has given some account of his life-work and experiences.

BAND-FISHES, a common name for certain elongated and compressed sea-fishes. The term is scarcely, if at all, used as a popular designation, but has gradually crept into literature as a pseudo-vernacular name, and has been adopted with the enlarged sense here indicated. Yarrell, in his *History of British Fishes*, employed it for the genus *Cepola*, only calling the ordinary British species (*Cepola rubescens*) the "red bandfish, or snake-fish." Dr. Günther, in the article "Ichthyology" in the ENCYCLOPÆDIA BRITANNICA, vol. xii. p. 672, employs it in the larger sense just indicated in our definition, applying it to the Cepolidæ, Trichiuridæ, Gymnetridæ, etc. The group so constituted is, however, an artificial assemblage, respecting which nothing can be predicated as universal except the superficial form. The specific forms confounded therein will therefore be noticed under their proper names—viz., DEAL-FISH, HAIR-TAIL, OAR-FISH, AND SNAKE-FISH. (T. G.)

BANGS, NATHAN, D. D. (1778–1862), an American Methodist Episcopal minister and author, was born at Stratford, Conn., May 2, 1778. When about thirteen years of age he removed with his parents to Delaware co., N. Y., where he received the common-school education of the time. At eighteen he taught a district school, and at twenty-one was a school-teacher and land-surveyor in Upper Canada. Here, through the ministry of Rev. Joseph Sawyer, he was led to connect himself with the Methodist society, a people whom he had previously despised. With his changed religious views he resolved to open his school each day with prayer, but this course soon brought upon him great opposition, which finally drove him from his post. A year later he was licensed to preach, and was at once assigned to a circuit of such dimensions that six weeks' time and almost daily preaching were required to make the round of the appointments. In 1802, Mr. Bangs was admitted into the New York conference, which then included the Canadas and a large part of New England. Once at least in the prosecution of his work he journeyed on horseback from New York City to Detroit. The Genesee conference was organized in 1810, at which time he became one of its members, and for the next ten years his labors were in and around New York. In 1820 he was elected "book agent," and for eight years had charge of the publishing interests of the denomination. During this term he was also editor of the *Methodist Magazine*, and at its close was appointed to the editorship of the *Christian Advocate*, then entering on its third year. In 1832 the *Methodist Magazine* was changed to the *Methodist Quarterly Review*, and Mr. Bangs was made its editor, with the added charge of editing the books of the general catalogue. In 1836 he was elected "missionary secretary," and for several years his entire energies were devoted to the missionary work of the Church. He was for a short time (1841–42) president of the Wesleyan University at Middletown, Conn. During the ten years from 1842 to 1852 he labored again as pastor in different churches in New York, the concluding decade of his life being one of serene and cheerful old age, animated by occasional writing and preaching. He died May 3, 1862. Dr. Bangs was a man of great energy. He was "never unemployed," and he never tired. He spent no strength upon Utopian projects. He saw at once what could be done, and to the accomplishment of his work he brought intense force. His miscellaneous writings, scattered through the periodical literature of the Church, are very numerous. He was also the author of several meritorious works, controversial, biographical, and historical. Among them are—*The Errors of Hopkinsianism* (1815); *Predestination Examined* (1817); *Reformer Reformed* (1818); *Life of Arminius*; *Life of Freeborn Garrettson*; *The History of Missions of the Methodist Episcopal Church* (1832); and the *History of the Methodist Episcopal Church* (4 vols., 1839–42). See his *Life*, by W. H. N. Magruder (1855). (D. W. C. H.)

BANKING.

BANKING in the sense in which the term is now generally used, originated with the Romans. A class of persons flourished in Athens who were called bankers, but their business was rather that of bill discounting. They gave no transferable credits to depositors; they simply received money at a moderate rate from those who did not wish to concern themselves personally with the management of it, and lent it to others at a profit. Another feature of their business was the exchange of coins for a premium. "The large amount of property possessed by Pasion," says Boeckh, "whose exchange bank produced a net profit of a hundred minas annually, shows that their business must have been extensive." On the other hand, they sometimes failed and lost everything.[1] The recently discovered monuments of ancient Babylon contain evidence that banking flourished in the Assyrian empire at least six centuries before Christ. In the reign of Nabupal-assar there was an important banking-firm which did business under the name of Egibi & Son, and "evidently acted as a sort of National Bank of Babylonia." Several tablets have been discovered containing the records of their business, and also a document which is proved to have been the bank almanac of the firm. From this we learn that the rates of interest charged were very high.

See Vol. III. p. 272 Am. ed. (p. 315 Edin. ed.).

Roman Banking.—The Romans conducted the business quite as we do. Credits were given to depositors, which were transferred from one person to another in payment of debts. Checks were a familiar instrument. Thus, one of the characters in Terence's drama of *Phormio* says, "But, Phormio, be good enough to go over to the Forum and order that money to be put to my account," and Phormio replies, "What! that for which I have already given checks to my creditors?" And Cicero in one of his letters says, "Of the remaining four hundred sestertia, I have paid two hundred in cash, and I shall send a check for the rest."

The earliest notice of Roman banking is found in Livy, but he says nothing about the way of conducting the business. It was carried on in the Forum. Though it is not known when the business was begun, the mode of its origin is well understood. Among the Roman people, for a long period in their history, the head of every family kept a family ledger, in which the incidents of his life were daily recorded, his revenues and profits, his losses and expenses. These occurrences, however, were first entered in the note-books or waste-books, and then formally recorded at the end of the month in the family ledger. The ledgers were preserved as heirlooms in the family, and were invested with a kind of sanctity. Moreover, they were used as legal evidence. When the bankers began business, their books were similar to the family record kept by every Roman citizen. "The entries in these books did not constitute the contract," says Macleod; "what made the contract was the loan of the money; the entries were only the evidence of the debt; and therefore they were the instruments of credit. They were exactly similar to our bankers' books at the present day."

"No branch of commercial industry," says Mommsen, "was more zealously prosecuted by the Romans than the trade of the professional money-lender and of the money-dealer or banker. The transference of the charge of the larger monetary transactions from the individual capitalists to the mediating banker, who receives and makes payments for his customers, invests and borrows money, and conducts their money-dealings at home and abroad—which is the mark of a developed system of capital—was already completely carried out in the time of Cato. The bankers, however, were not only the cashiers of the rich in Rome, but everywhere insinuated themselves into minor branches of business, and settled in ever-increasing numbers in the provinces and dependent states. Throughout the whole range of the empire the business of making advances to those who wanted money began to be, so to speak, monopolized by the Romans."

During the rule of the first Cæsar, money-dealing assumed still vaster proportions. "The Italian merchants, vying with the Jews, poured themselves into all the provinces and client states of the kingdom, and all capital ultimately flowed to Rome. The effect of centring so much capital in Rome was to reduce the rate of interest. The usual rate was 6 per cent., which was less by half, on an average, than prevailed elsewhere in antiquity."[2]

Florentine Banking.—After the decline of Roman banking the business next flourished among the Florentines. With them, however, the business was rather that of lending money than conducting a banking business, as the Romans had done. The Roman court needed much aid in the collection and transmission of dues to Rome from the distant parts of Europe. When the papal court was removed to Avignon, the need of bankers to transmit its revenues between Italy and that city became greater than ever. Of all this banking business the largest and most profitable portion was in the hands of Florentines, whether residing in Florence or in the various commercial cities of Europe. As early as the first quarter of the twelfth century they lent money to sovereign princes. In the thirteenth century the Florentine houses of the Mazzi and the Spini acted as papal bankers and farmers of the papal revenues; and in the last days of the republic the Strozzi served in the same capacity, accumulating the wealth which is enjoyed by their descendants to the present day. The Alberti in the middle of the fourteenth century had houses or counters in Avignon, Bruges, Brussels, Paris, Siena, Perugia, Rome, Naples, Barletta, and Venice. The Peruzzi and their associates the Bardi had agencies scattered still more widely over Europe.

The successes of the Florentine bankers were not to continue. In 1346 a gigantic failure occurred. It was occasioned by the non-payment of 1,365,000 gold florins borrowed by Edward III. of England. His inability to pay was caused by his wars with France, though he was successful in these and crowned his final triumph by making the king of France a prisoner. "There may yet be read," says Trollope, "in the account-books of the Peruzzi family, still preserved by their descendants, the ominous entry, under the date of 1339, of 200 lire 16 soldi paid for sending an armed galley from Barletta to Rhodes with the news that war had broken out between Edward III. and France."

Subsequently, the Strozzi suffered heavy losses by the king of France and by the popes. Money-lending was a very hazardous business in the Middle Ages. On the other hand, it was very lucrative. The two conditions usually coexist. The wealth that flowed into Florence is proof that though her losses were sometimes very great, her gains were far greater.

The utmost prudence and careful calculation prevailed with respect to the transmission and receipt of money and terms of payment. From Pigolotti we learn the rules that existed in the first thirty years of the fourteenth century concerning the way in which bankers should proceed in calculating money to be paid abroad, and detailed notes are added on the fluctuations of the money-market in consequence of fairs, expeditions of galleys, and the proceedings of states. The effect of the movements of the papal court did not escape the notice of this experienced Florentine. He says, "Wherever the pope goes, money is dear, because from all sides one has to pay so much to him. When he goes away, an ebb sets in, because the members of his court, if they are not rich, must borrow." The times when the bills fell due were regulated generally by the distance. An order drawn at Florence on Pisa or Venice was due on the fifth day after the money was paid; in Rome and Genoa, on the fifteenth day; in England, on the seventy-fifth day; and so on. But the contracting parties could fix any time they desired. The years between the death of Ladislaus of Naples, in 1414, and the beginning of the war with Milan, were perhaps the most prosperous Florence ever saw. "At this period," says Ammirato, "there were counted 72 banks in the streets round about the Mercato Nuovo. It was estimated that the amount of gold currency in the city was upwards of two millions of florins."[1]

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[1] For an account of banking in Greece, see Boeckh's *Public Economy of the Athenians.*

[2] On Roman banking consult Macleod's *Principles of Economical Philosophy*, vol. i., sec. v.; Mommsen's *History of Rome; Économie politique des Romains*, by Dureau de la Malle.

The Bank of Venice.—There was no bank in Florence resembling the institution with which we are familiar. The monetary transactions just described pertained simply to the receipt and loan of money. In Venice, in the year 1171, originated the first bank concerning whose organization and subsequent operations we have any clear knowledge. Its history has been ably written by Stephen Colwell in his *Ways and Means of Payment*, and our brief account will be drawn principally from this source.

The republic, in consequence of costly war expenditures, was obliged to resort to a forced loan from its most opulent citizens, whose contributions were determined by their ability. On this occasion the office of chamber of loans was established. The contributors to the loan were made creditors of that office, from which they were to receive an annual interest of 4 per cent. The book in which the loans were inscribed was authenticated by the Government and made evidence of the debt, with the proportion belonging to each subscriber. This having been done, it was easy to transfer these loans in part or wholly from one person to another. The interest was punctually paid by the Government into the office, which distributed it to the holders of the debt. Facility of transfer, coupled with the security of the state and regular payment of interest, caused a very rapid circulation of the loan. "This practice," says Storch, "in the course of time exhibited to all the lenders how very simple and easy was the process of paying and receiving debts among themselves by transfers upon these books; and from the moment that the advantages which commerce might derive from this method of paying debts was perceived, bank-money was invented."

The original capital, or subscription, is said to have been 2,000,000 ducats. In the middle of the 18th century the amount was estimated at 5,000,000, and towards its close, when the bank expired, at 14,000,000 or 15,000,000 ducats. The Government had no difficulty in enlarging the stock of the institution, for the quantity of money seeking such an investment was always greater than the amount needed. The money deposited for the purpose of obtaining a credit was accounted an addition to the original loan; every investment, therefore, of the kind increased the stock of the bank and replenished the public treasury. "If individuals could make purchases and pay debts by transfers in bank, the public treasury could well afford to receive, in payment of its dues, credits in bank, as that would be only equivalent to taking up its own obligations. Thus, the more these credits were employed, the more the demand for them increased, the more rapidly money flowed into the treasury, and the more readily the Government could afford to receive payment of its revenues in the funds of the bank."

The mode of making transfers may be next described. Every person applied to the bookkeeper of a particular division of the bank, according to an alphabetic arrangement of names. The transferrer appeared before the two clerks belonging to that division and dictated the entry he desired to have made, which was written in two books. The entry specified what was paid, whether a bill of exchange or a balance of account, and, if a bill, when it was drawn, etc. These entries on the books of the bank were proper evidence for all payments.

"The facility of payment," remarks Colwell, "furnished by the bank consisted in substituting, as a medium of payment, the debt of the republic for current coin." The coins in circulation caused many vexations. They were exceedingly varied, comprising those furnished by the numerous mints of Italy, and the still larger variety resulting from the accumulations of more than a century. To this mixture was added the coinage of Eastern countries with which Venice carried on commerce. To make all the payments of the domestic and foreign trade of Venice in these coins required much time, patience, and skill. The benefit conferred by the Government through the bank in this regard was very great. The Government took the coins, giving therefor a corresponding credit in the bank, and allowed the depositor or lender to transfer this credit claim on the republic in payment of his debt, instead of delivering coin in each payment. Whatever men can employ in paying debts they are willing to receive in like manner.

The convenience of this mode of payment was clearly seen. These bank-credits could be divided to any degree that was desired, and they could be transferred with speed and safety. They were far superior to paying in coin. The same sum or credit might be kept in such rapid circulation as to effect an amount of payments in a specified time far exceeding any possible movement in coin. By thus increasing the circulation of the paper credits a great economy in the use of coin was effected.

In 1423 a noteworthy change was introduced in the policy of the bank. It was decreed that all bills of exchange payable in Venice, whether domestic or foreign, should be paid, unless otherwise expressed, in the bank, and that all payments in wholesale transactions should be effected in like manner. By the introduction of this policy the mass of payments made in the city were effected in the bank. The bad condition of the coins circulating in Venice was a sufficient recommendation of the new regulation to all who had no very special reasons for disliking it. The measure at once created an additional demand for the funds of the bank, and brought large sums into the public coffers. The Government, however, no longer paid interest for the sums received from the bank. The money was deposited to pay bills of exchange, and not with the view of getting interest. The payments during the intervals when the funds remained in the hands of any merchant were too short to make him solicitous about interest on balances or deposits. This mode of payment, though it could be changed by express stipulation, soon became the usage of trade. All who had engagements to meet found them in the bank, and, of course, provided it with the funds required for their discharge.

"The republic could well afford to maintain a liberal policy towards an institution so important both as a fiscal and commercial agent. That the inhabitants of Venice were well satisfied we cannot doubt, as not an objection was ever made to the bank, at least none is extant; neither book nor sheet nor pamphlet have we found in which any merchant or dweller in Venice ever put forth any condemnation of its theory or its practice. There was no hesitation in carrying money to the bank, so long as it was not doubted that bank-funds would purchase specie without loss whenever it might be needed; and the uniform premium of bank-funds settled that point. Under such a system the regular payments of trade would proceed with a rapidity and economy previously unknown, so far as the history of commerce informs us."

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[1] On Florentine banking see Capponi, *Storia della Repubblica di Firenze*; Conte Pecchio, *Storia della Economia Pubblica in Italia*; Cibrario, *Économie politique du Moyen Age*, trans. from the Italian; Trollope's *History of the Commonwealth of Florence*.

It was finally seen that the merchants needed a place of deposit, a bank, or office in which coins or bullion could be deposited in safety, with the right of withdrawal or transfer at pleasure. To meet this requirement the Government established a second or coordinate department of the bank. Money was to be received and credited on the books of this office to the depositor. Those who received money for which they had no immediate use, or who brought money to Venice for the purpose of making purchases, could keep it at the bank until they wished to use it. Not only could they withdraw it, but also transfer it when they pleased, and the funds of this branch were always liable to be withdrawn. "The success of this depository," says Colwell, "did not check the flow of money into the public coffers, as the demand had always been greater than the supply of bank-funds, and therefore caused no complaint or disappointment on that ground. It was perfectly apparent that the bank, by this addition, had become a vastly more efficient and useful institution; and the whole policy of the republic shows that the importance of a steadfast and firm support of the bank was perfectly understood."

A large amount of specie accumulated in the depository, which was transferred on the books from one person to another. It bore no interest, and was very fluctuating in amount, corresponding with the changes and vicissitudes of trade. It was an index of trade-movements, just as the clearing-house returns are a partial index in these days. Notwithstanding the fluctuations in quantity, as a considerable amount always remained on deposit, the Government, on pressing occasions, drew specie from this source. Twice the cash-office suspended specie payments, and on one occasion the suspension lasted several years. Nevertheless, the faith of the people in the Government was so strong that transfers of these deposits continued just as though no specie had been taken away. Ultimately, the Government returned the full amount taken; consequently, the depositors suffered no loss.

The Bank of Venice enjoyed a great reputation throughout the commercial world, and was of vast importance to Venetian trade. Its advantages were so fully comprehended by Venetian merchants that those engaged in Eastern trade established a bank at Damascus. When pillaged by an Eastern conqueror early in the 15th century, it had become the depository of much treasure.

The unit of the money of account in the bank was the ducat. A gold coin of that name had long enjoyed in Venice an exemption from the changes so frequent there in coins, and was held in high repute far and near for its purity. The bank continued to perform its functions until 1797, when it fell a victim to the ambition of Napoleon. It had had a splendid history, and even now valuable ideas may be gained from a careful study of its origin and management.[1]

The Bank of St. George.—More than a century and a half passed after the founding of the Bank of Venice before the Bank of St. George arose. This was a Genoese institution; and its history is perhaps better known than that of the Bank of Venice. An author has declared that it was the "cradle of modern commerce, modern banking schemes, and modern wealth." Macchiavelli in his History of Florence says of it, "An example indeed most rare, by philosophers in all their imaginations and conceptions never found, is that system of administration adopted in Genoa in the '*compere*' of St. George. . . . So that if it could happen that this city [Genoa], full as it is of ancient and venerable customs, might fall entirely into the possession of the Bank of St. George—which doubtless in process of time will happen—it will then be a republic of greater importance than even that of Venice."

The origin of the bank was not unlike that of the Bank of Venice. In 1148 the Ligurian republic borrowed money of its citizens, and pledged certain revenues in payment. The creditors nominated from their own number a council of administration to watch over their common interests. Every hundred francs loaned were termed a share, and every creditor a shareholder. Each shareholder's separate amount of shares was summed up as "a column" and entered in a book which was called "*cartulario*." Each loan was termed a "*compera*," and all of them were collectively known as the "*compere* of St. George," which in later years became the celebrated bank.

The loans multiplied. Generally a loan took the name of the object for which it was raised, or the name of the saint on whose day it was made, and the money was obtained by a public auction. The investment was sold to the merchants, who were always ready to purchase. In a loud voice the name and object of the loan were proclaimed in the streets, and the tax which was to be put into the possession of the purchasers to secure its repayment. By 1252 these loans had become so numerous that it was necessary to consolidate them and appoint a chancellor and other officials to watch over them. At length the aggregate was so large that the people were alarmed about the amount. So in 1302 commissioners were appointed at a great assembly, and articles and very specific regulations were drawn up to give additional security to investors. Thereafter no loan was to be made without the sanction of the consuls and the confirmation of the greater number of the shareholders. These consuls bore the name of "sapienti," or assignees of the shares.

In 1336 a singular loan was effected. Cardinal Fieschi assigned to his creditors, for the advancement of a considerable sum which was to be used for the public benefit, "the sacred basin," or Holy Grail; and this contract bore the title of the "cardinal's loan on security of the sacred Parossidis." Subsequently, other loans were made, and in 1339 there was a revolution, all the old books were burned, and a new commission was appointed to regulate the "*compere*." The Government expenses had been so great, and the treasury was so exhausted, that the doge and council had been obliged to concede a very large portion of the public revenues to meet the demands of the public creditors. The results of the conquests made by the republic in the interval were all ceded for a limited period to the shareholders, and the loans were consolidated into one under the newly-appointed commission.

Every year and every event tended towards this system of blending the loans together, to which fact is due the extensive power which the directors of the bank eventually wielded. The process was very beneficial for the shareholders in weak transactions. It was no less so to the larger ones. All were alike concerned in preventing failures and preserving the general credit of the republic. "Here we have," says Mr. Bent (from whose valuable history on Genoa this account is mainly drawn), "the development of this financial republic inside of a democratic one: one poor, turbulent, rocked by sedition, and torn by discord; the other rich, peaceable, well-regulated, and maintaining its ancient probity—a unique example, both within and without, of public good faith."

At the close of the 14th century the distress of the Government was so great that taxes were levied on everything that would yield a revenue. Even dead bodies were taxed; rubbish could not be carried away without paying a tax; a man could not sweep the snow away from his door-step without paying for the privilege. At this critical moment a scheme was devised by Francesco Vivaldi which was as patriotic as it was novel, and which proved effective in extricating his country from peril. He owned several shares of the bank, the income from which he proposed should be perpetually applied in buying other shares, and the income from them to be applied in like manner; "nor must you ever stop," he said, "as long as a single debt remains in the republic and whilst you read in the books a single subsidy which weighs on you and on my fellow-citizens. This is my will, and if it is transgressed, or in any part neglected, I will cancel the gift, either myself if alive, or by the hands of successors if I am no more." The example set by Vivaldi was followed by many others in after years. It gave men a new insight into the magical power of accumulating interest.

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[1] For the Bank of Venice see Daru's *Histoire de Venise*, and Marperger *On Banks*.

Meanwhile, the credit of the bank increased. Hospitals, churches, and confraternities placed their capital therein. Corporations and civil establishments deposited their possessions in it. The bank employed its funds to the best advantage. If a family chose to build a church, or a bridge, or other public work, bank shares were assigned as an endowment.

In 1407 a new constitution was given to the bank. Out of thirty-two notable citizens, chosen by lot from those most interested in the "*compere*," eight were to be taken whose interest in the institution should never be less than 1000 Genoese florins, and who were to be its protectors. They were to have no special interest in any tax; and to them was consigned the chief executive power. At this time, too, all the shares were united, and the interest was fixed at 7 per cent. A thorough reconstruction occurred, and the institution was renamed the "Bank of St. George." Its credit never failed, and no anxiety was ever felt by any shareholder about his annual income, until the days of the French Revolution.

The bank was established to fulfil certain ends, and in achieving these it was successful; but such an institution could not flourish nowadays. It issued its paper only for the amount of coin in its possession; and this would not suffice for the needs of modern commerce. The highest form of security was required in its transactions. As we have remarked, the Government was obliged to pledge its taxes in order to secure the advances made to it. About 1550, during the dogeship of Andrea Giustiniani, when coin was brought from Sicily and great distress prevailed in Genoa, a large portion of the debt was made irredeemable. The Government, in consideration of a large loan negotiated by the bank, agreed to assign the taxes on certain commodities in perpetuity, and no further tax was to be placed on them without the consent of the shareholders. Previous to this the tax had been conceded only for a term of years, until the loan should be paid. Even colonies and provinces were ceded to the bank when the Government felt too weak and too poor to maintain them.

The public negotiation of loans at the street corners was continued long after the complete organization of the bank. Not until 1675 did the directors recognize the necessity of adopting a more convenient mode of transacting business by means of separate branches in the city, where loans could be negotiated and money drawn, after the fashion of a modern bank. Then at last did the name of "*compere*" disappear.

During the last two centuries of its existence the bank frequently experienced great difficulty in providing the Government with funds. After the French and Savoy invasion the Government was compelled to raise forced loans independently of the bank. During the Austrian invasion most of the gold of the bank was carried off by the invaders. The bank established a "monte of preservation," in which were written down all the interest and sums of money which it could not pay, and on which higher interest was allowed. After the Austrians left, and order was restored, these obligations were discharged.

"It is melancholy," says Bent, "to have to draw a veil over the career of this illustrious bank with the revolution of 1798. The new order of things which Genoa had learnt from France deemed it inconsistent with liberty that the taxes, the property of the republic, should remain in the hands of the directors of St. George; it was voted a tyranny on a small scale, and the directors were compelled to surrender them; and, inasmuch as the taxes represented the sole source from which their income was derived, they discovered that their bank-notes were useless, and the building was closed shortly afterwards." In 1804 and 1814 attempts were made to resuscitate the bank, but failed, and so, after a long and splendid history, it came to an end.[1]

The Bank of Amsterdam.—The origin of the Bank of Amsterdam was very different from that of the banks mentioned. Previous to its establishment the clipped and worn foreign coin which the extensive trade of Amsterdam brought from all parts of Europe had reduced the value of its currency about 9 per cent. below that of freshly-minted money. Moreover, while there was always an abundance of money of some kind in the city, the merchants were often troubled to find a sufficient quantity of good money to pay their bills of exchange, and the value of these bills, in spite of the regulations which were made to prevent it, became uncertain. To remedy this inconvenience in 1609 the bank was established under the guarantee of the city.

The bank received all coin, whether foreign or light, at its real value in standard coin, deducting a small sum for defraying the expense of coinage and of management. For the amount deposited a credit was given on the books of the bank. This credit was called bank-money, and always possessed the same real value, and was worth more than the money in circulation. It was declared also at the formation of the bank that bills drawn on Amsterdam or negotiated there of the value of 600 guilders or more should be paid in bank-money. This regulation took away all uncertainty regarding the value of such bills. Consequently, every merchant was obliged to keep an account with the bank in order to pay his foreign bills of exchange—a regulation which necessarily occasioned a large demand for bank-money. This bank-money possessed other advantages. It was secure from fire, robbery, and other accidents; the city of Amsterdam was bound for it; it could be paid away by a simple transfer, without the trouble of counting or the risk of transportation. These advantages were so obvious that the bank-money bore an agio or premium, and it has been generally believed that all the money originally deposited in the bank was allowed to remain there, nobody caring to demand payment of a debt which he could sell for a premium in the market. If payment were demanded, the premium would be lost; so of course it was for the interest of the depositor to keep his coin undisturbed.

The deposits which the bank was thus bound to restore in coin constituted the original capital of the bank, or what was represented by the bank-money so called. "At present," said Mr. Hope in his description of the bank which he furnished to Adam Smith a little more than a century ago, "they are supposed to constitute but a very small part of it. In order to facilitate the trade in bullion, the bank has been for these many years in the practice of giving credit in its books upon deposits of gold and silver bullion. This credit is generally about 5 per cent. below the mint-price of such bullion." The bank gave a receipt to the depositor which permitted him to take out the bullion at any time within six months on retransferring to the bank a quantity of bank-money equal to the sum deposited, besides paying one-fourth per cent. for keeping if the deposit were silver, and one-half per cent. if it were gold. The receipt further stipulated that in default of such payment, and on the expiration of this term, the deposit should belong to the bank at the price for which credit had been given on the books.

Deposits of bullion were most common when the price was somewhat lower than ordinary, and were taken out when the price advanced. A receipt for bullion was almost always worth something, therefore only a few suffered their receipts to expire, or allowed their bullion to fall to the bank at the price expressed on the bank-books. The person making such a deposit, and obtaining both a bank credit and a receipt, paid his bills of exchange as they became due with his bank credit, and either sold or kept his receipt as he judged the price of bullion to be likely to rise or fall. The two seldom kept long in company; nor was there any reason why they should, for a person having a receipt who wished to take out bullion never had any difficulty in getting bank credits or bank-money at the ordinary price; and, on the other hand, a person having bank-money who wished to take out bullion could easily find receipts.

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[1] For the Bank of Genoa see Cuneo, *Storia del Banco di San Giorgio*; Lattes, *La Libertà delle Banche a Venezia*; and Colwell's excellent sketch, *Ways and Means of Payment*.

The wisdom of establishing the bank was soon perceived. The risk involved in money transactions was reduced to the lowest degree, and the difficulties connected with the coinage were wholly overcome. The bank received its first serious check in 1672. With the invasion of the country by the French an alarm spread for the safety of the bank deposits. Although the depositors were not strictly entitled to draw them, they did nevertheless demand coin for their respective credits. The bank complied fully with the demand. Those living at a distance from Amsterdam sold their credit even at a discount of 5 or 6 per cent., which was equivalent to a total loss of 10 or 12 per cent. as credits were, at all ordinary times, worth 5 or 6 per cent. more than par. The alarm, happily, soon subsided.

For nearly two centuries the bank performed its functions with great efficiency. The amount of its treasures was for a long time a matter of constant speculation. At the time when Mr. Hope wrote his sketch he said it was generally believed there were about 2,000 depositors, and that the bank possessed £3,000,000. No public examination of its affairs ever occurred, but deposits were made with unhesitating confidence throughout its long existence until its close. In 1790 it was discovered that a large portion of its deposits had disappeared fifty years before, and that a gradual diminution had since been going on until but a very small amount remained. The deposits had been lent to the East India Company, the provinces of Holland, and the city of Amsterdam, and restitution was impossible. Before this breach of trust became known, transfers of the abstracted deposits in the way of payment had been made to the value of hundreds of millions sterling per annum, yet the validity and efficiency of such payments were never questioned. No evil was experienced until the abstraction was discovered, when the loss fell on the holders of the bank obligations.

The Bank of Hamburg.—The Bank of Hamburg was established ten years after the bank just described. The object of founding it was to remedy the same evils as existed at Amsterdam. The plan was essentially similar—to receive the coins, however debased they might be, and circulate the credit granted for them. It was found that one effect of circulating a base coin was to produce an unfavorable exchange, which was a great evil at a free port like Hamburg. At first the bank received on deposit only the rix-dollars of the German Empire, a silver coin of approved standard. But after a time the empire began to issue coins bearing the same name, though slightly reduced in value. These were circulated, and soon found their way into the bank. The merchants who knew of the Government trick drove a very successful business by depositing the new and withdrawing the old coins. The bank, singularly enough, did not discover the fraud until a very large exchange had been effected. The new coin was of less value than the old in the proportion of 516 to 540, or nearly 5 per cent. The confusion caused by the discovery was so great that for a time the bank was closed. The difficulty was adjusted by assuming an average proportion—say 528—and on this basis the accounts were settled. This mark banco was not represented by any coin, but from that date (1770) it has formed the unit of the money of account in the bank. At the same time it was decided that coins should be received only as bullion. Every deposit was assayed or tested, and credit given to the depositor according to its value. The standard adopted was 1 of alloy to 47 parts fine. This bank-money has varied as little as any other in Europe. Says Colwell, writing in 1859, "For a long period it has stood at a premium above the currency of coins in general circulation—from 20 to 25 per cent. premium."

The bank is governed by five directors, two counsellors, two treasurers, and two of the principal magistrates of the city, one of each kind going out annually. No employé of the bank, or broker, is allowed to open an account, for brokers in Hamburg are not regarded as merchants, and only the latter, and of those only such as are citizens of the place, are permitted to open accounts. A loan-office is connected with the bank which lends bank-money on the pledge of gold, silver, and jewels to the amount of three-fourths of their value.

Its credit has been rarely shaken. We have already mentioned one of its trials, caused by the unknown depreciation of the coinage; on another occasion it over-extended its loans on pledges, and still later its money was taken by one of the marshals of Napoleon. The French Government afterward made restitution, and the bank resumed operations, which have been successfully continued to the present time.[1]

Banking in Sweden.—The Bank of Sweden was the inventor of the bank-note in Europe. While describing this institution, we shall also glance at the banking system of that country, for it is well worthy of study. The Swedish bank was founded in 1656 by a Swede named Palmstruck, and the bank-note was issued two years later. The origin of this bank, therefore, is three years earlier than that of the Bank of England, and marks a great advance on the modes of banking practised in the institutions already described. It is a national concern, and it has been affirmed that in more recent times Sweden, like Scotland, has owed much of her prosperity to her system of banking.

The Swedish monetary circulation consists mainly of silver and of notes issued by the Bank of Sweden and by the private or "Enskilda" banks. The latter are to be regarded as large private partnerships composed of a great number of members. The first "Enskilda" bank dates from 1830, but the present method of conducting business was adopted in 1856, when the "Enskilda Bank of Stockholm" was founded. Not one of these banks has ever failed or suspended for a day. They include small notes in their issues of less value than $1.50. The amount of notes in circulation is very large, considering the sparseness and condition of the population, and exceeds $5 for each inhabitant.

The note circulation is regarded so highly that it is received everywhere. All the "Enskilda" banks are bound by law to cash their notes, either in silver or in notes of the Bank of Sweden, at their own offices. For their own convenience they exchange notes at Stockholm, that city being the Swedish monetary centre. The credit of the note circulation is maintained by a governmental superintendence over the banking system and by numerous public regulations, one of which declares that a certain proportion of the capital of each bank must be invested in sound securities before a note can be issued. An "Enskilda" bank may issue notes for three-fourths of its capital and for the cash on hand and the balance in its favor at the Bank of Sweden, which is regarded as equivalent to coin, and also the amount of cash credit securities which it holds. There is a limitation, however, in respect to the amount of notes which may be issued against the last-named securities. They cannot exceed one-half of the paid capital.

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[1] Busch's *La Banque de Hambourg*, trans. from the German.

The securities forming the base of the note circulation must be either the funded debt of Sweden or mortgages on landed property not exceeding two-thirds of the value at which it is taxed, and mortgages on house-property in towns within half the value at which it is insured against fire. These securities are deposited under the supervision of a commissioner appointed by the governor of the province.

The currency is effectually regulated; every note is payable in coin or the legal-tender notes of the country, the circulation of which is largely based on the precious metals.

The advantages of a note circulation like this are very great, especially to a population scattered for the most part sparsely over the country. Besides the saving effected by the slight use of coin, a still greater one accrues from the transmission of money from one place to another without charge. Drafts on demand are issued by all the "Enskilda" banks, which are readily cashed by them anywhere.

"As far as legislative enactments and methods of keeping accounts go," says Palgrave, "Sweden is better provided for than any country in Europe. The concurrence of the commissioner appointed by the governor of the province in the examination of the bonds and mortgages in which that part of the capital of banks is invested against which the note circulation is issued; his concurrence also in the drawing up of the quarterly balance-sheets; and the power reserved to him of examining the accounts and transactions of the bank at any time whatever,—are in themselves great securities against the statements being falsified. There is a further power reserved to the minister of finance to cause an investigation to be made at any time he thinks fit, and to ask for explanations. The government audit so often desired is thus attained without difficulty; but, while everything connected with these banks is thus laid open to inquiry, no one is allowed to make known the private transactions of the customers." Such are the leading points in this remarkable system of banking, which bears so many resemblances to the national system existing in the United States.

During the 18th century Sweden suffered from the ill effects of a forced and depreciated currency, but in 1830 the circulation had been restored to a basis of two-fifths of its volume in the precious metals. Ten years afterward, owing to a succession of bad harvests, the reconstruction of the Bank of Finland, and the return of Swedish notes previously circulating in Finland, the metallic reserve was drained so low that the revival of a forced circulation was feared. The working of Peel's acts in England had been carefully watched in Sweden, and in 1845 the Bank of Sweden was authorized to issue notes to the amount of $8,425,000 in excess of its reserve. The bank, however, has never had authority for reducing its metallic reserve below $2,808,330. The existing note circulation of the bank beyond the unsecured amount of $8,425,000 rests on (*a*) the metallic reserve just mentioned, (*b*) gold and silver deposited abroad or in course of transit, and (*c*) cash at call with foreign banks and companies. This regulation has been suspended twice within a few years—in 1869 and in 1873.[1]

Banking in Norway.—Before leaving the north of Europe, something may be profitably added about another banking institution, which, though much younger than any bank mentioned, by reason of its peculiar constitution and excellent management is well worthy of description. The Bank of Norway was founded in June, 1816, and has its principal office at Drontheim, with branches in the more important towns. Its capital was raised in the beginning by a forced loan or tax on all landed property, and the landholders became shareholders according to the amount of their respective payments. In a short time these shares became valuable, and were worth more than they cost.

Two kinds of business are conducted by the bank. The bills or notes taken are only for a short date, as it is one of the principles of the bank that all its securities of this kind must be available at short notice. But this is not its principal business. Such a system would not be of much use to a nation of landholders. Its business consists chiefly in advancing its own notes on securities of land, no loan exceeding two-thirds the value of the land pledged. The borrower pays half-yearly to the bank at the rate of 4 per cent. per annum, and is required also to pay off 5 per cent. yearly of the principal, which is thus liquidated in twenty years. The bank, therefore, has a twentieth part of its capital repaid every year, and draws 4 per cent. for the use of what remains outstanding. In case the interest and instalment are not paid when due, the bank proceeds by a swift process to sell the property at public auction, and reimburses itself with the money thus received.

It will be readily perceived that a paper money issued on this basis is very safe, hardly inferior to that of the precious metals. The profits of the bank are not very great, because its capital is turned over only once in twenty years. The accommodation afforded by the system to a nation of small proprietors is incalculable.

The bank has the exclusive privilege of issuing notes in Norway. Its capital, fixed originally at $2,227,665, has been increased from time to time, and the charter has been modified on several occasions, the state assuming more and more authority in the management of its affairs. Its notes are payable in gold on demand, and are a legal tender, and the state is practically responsible for their ultimate redemption.

Laing, in his *Travels through Norway* during the years 1834, 1835, and 1836, describes the "corn banks" then existing; and these are worth brief mention. He says, "The farmer takes his surplus grain to it, and for the time it remains he receives at the rate of one-eighth of increase per annum; if he deposits eight bushels, he can take out nine at the end of twelve months, or in that proportion for shorter periods; and he is charged at the same rate of one-eighth per annum for any portions of his quantity he may take out. If he overdraws or had none deposited, but receives a quantity in loan, he pays for such advance at the rate of one-fourth of increase per annum: thus, if he takes eight bushels he pays back ten at the end of twelve months, or at that rate for the time he has the loan. This is a savings bank for corn, probably the most ancient of these establishments. It often occurs that night frosts blight the crops on particular farms, even in seasons when those around, in general, are good. But for these ingenious establishments the farmer might be in great distress for seed or bread. The small profit which occurs upon the transaction defrays the expense of a building, a clerk, and such items, and the concern is entirely under the management of the bönder or peasant proprietors."

Banking in France.—The first bank in France was a failure not less remarkable than the success of the present institution. John Law was the father of the first—a Scotchman, born in Edinburgh in 1671, of brilliant qualities and pliant character, but withal a very shrewd observer and the expounder of many striking and by no means wholly erroneous ideas. The fact that his magnificent scheme suddenly and utterly collapsed has led many to imagine that his notions were totally wrong and visionary, and that in his quite numerous works nothing can be found worth knowing. This is a mistake. Law had studied the constitutions of the banks of Amsterdam and England thoroughly before launching his own enterprise. The former was a bank of deposit and the latter of circulation, and what Law sought to do was to combine the advantages of both. In order to understand Law's scheme thoroughly, let us briefly state what these two banks were doing in his time. At the Bank of Amsterdam the precious metals were deposited, and in return a certificate of the value deposited was issued, payable on demand, which was put into circulation and passed current as money. The advantage of the system consisted in the convenience of employing paper certificates, or notes, instead of coin; and, inasmuch as the coin at this period was often much debased, the issue of certificates for a fixed quantity of a known purity was preferred to payments in coin of varying values. But the Bank of England had a wider scope. It accepted the notes of merchants, and gave its own to them in exchange, which had wider circulation and were taken as money. A reserve of bullion was kept to secure the redemption of its own notes, and by the adoption of this system greater currency was given to them.

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[1] A translation of the banking law of Sweden may be found in Palgrave's *Notes on Banking*. This work may be profitably studied with reference to banking in Sweden, Denmark, and Hamburg.

Law, believing that France was the best field for operations, went thither and offered his services to Louis XIV., but they were declined. After the king's death he obtained the ear of the regent, the duke of Orleans, and the latter was soon persuaded of the feasibility of Law's scheme. The financial condition of France at this time was very bad, and no one knew how to extricate the state from its embarrassments. Various economies had been effected, yet the revenues fell far below the expenditures, and public credit was gone. At such a time, very naturally, those at the head would gladly turn to any one having a plan for relieving the distressed country. The council of finance was utterly opposed to Law's plan; and the regent, not daring to permit Law to proceed without the sanction of that body, could do nothing more at first than to grant permission to him to establish a private bank. It was to exist for twenty years; the shareholders were to enjoy many privileges; their profits were to be free from taxes; and if they belonged to foreign countries their rights were to be maintained. The bank was to be subject to state control. The regent consented to become its protector, while royal inspectors could investigate its affairs. Its capital consisted of 1200 shares at 5000 livres each. Its notes were issued for different sums, on demand, convertible into coin. At this time the public debt had been reduced by a succession of ordinances from 600 millions of francs of various securities to 250 millions in state notes. The shares were purchasable with these notes to the extent of three-quarters of their value; the other fourth must be paid in silver. The bank was required to furnish twice a year a true account of its affairs, and in June and December it was to be closed for five days for the shareholders to examine and verify the statements submitted to them. The bank was prohibited from borrowing money or engaging in commerce. It was simply a bank of discount and deposit.

These regulations seemed unexceptionable, and no one had any reason for expecting that the bank would be perverted to an improper purpose. Its success was immediate. To those needing pecuniary accommodation it offered short loans at a rate of interest much below that formerly paid; and for a very moderate remuneration it undertook to keep the accounts of all who saw fit to intrust it with their money on condition that at any time it might be drawn out. But the payment of its notes in coin of the same fineness and weight as that which circulated on the day when the notes were issued was the grand feature which inspired the highest degree of public confidence. This gave to the circulating medium a stability which it had not possessed since the reign of Philippe le Bel. The public gladly availed themselves of the settled common measure which Law had devised, and eagerly deposited their money in the bank in order to obtain the use of the paper.

During the first year the extension of the bank circulation was left to the operation of ordinary influences. But its circulation was confined to Paris and a few large towns. Law and the regent wished to extend the circulation throughout the country. An ordinance was therefore issued in April, 1717, that all official persons connected with the public revenue should accept payment in the notes of the bank, and should also cash them on demand. From that date all remittances between Paris and the country were made in bank-notes. The money from the country now found its way into the coffers of the bank, and Law beheld the first realization of his project—a bank of circulation having for its reserve all the metallic money of the country. With a capital of 6,000,000 francs, Thiers says that Law had succeeded in issuing from 50,000,000 to 60,000,000 of notes without shaking its credit.

Its success was so great that the regent no longer hesitated to convert the institution into a national bank. Two edicts were issued in December, 1718, directing the conversion and explaining the mode of effecting it. The Government was to purchase all the shares at their original cost, making itself responsible for the liabilities of the bank. Its new notes were payable at sight, but not, as formerly, in coin of the same fineness and weight as that in circulation on the day of their issue. They were to be taken, too, in payment of taxes, and all the revenue collectors were commanded to extend the utmost encouragement to their circulation. In consequence of this new policy, no one was afraid to receive the notes, for, if he had taxes to pay, they would be gladly accepted by the fiscal officer, and in any case they could always be exchanged at the bank for an equivalent number of livres in coin. But Law, while maintaining the convertibility of the notes, knew well enough that the system would fall if the people were not permanently rather desirous of getting and keeping the notes than the coin which they represented. In other words, the essence of his plan was to have his notes always convertible, but never converted.

The next movement of Law was to engraft a mercantile company into the bank. The Company of the West was organized, with a monopoly of the commerce of Louisiana and Illinois and the beaver-trade of Canada. Then the Company of the Indies, founded by Colbert, was incorporated with the Company of the West, and thus nearly all the profits of the commerce of the time were engrossed, while Law's aspirations mounted still higher to the founding of empires in the new countries which were virtually given over to his control. The shares were limited to 200,000, at 500 livres each, but at first they did not meet with a ready sale. They were payable in state notes, which were at a considerable discount. The holders of state notes did not readily avail themselves of the opportunity to exchange them for the shares of the company, but Law at once invested those belonging to the bank in this manner, thus mingling the interests of both.

One object of the regent and of Law in establishing the bank was to reduce the state burdens and render future loan operations more easy. Although the public debt had been scaled to a large amount, it still pressed heavily on the Government. In the beginning the bank sold its shares for state notes, and so rid the Government of a great amount of floating debt. This was an easy operation, because the state bills representing this debt were at a heavy discount. The regent's plan was to authorize the bank to manufacture large quantities of notes on his account and put them at his disposal. With these he proposed to purchase shares of the Company of the West. Thus it would be in possession of an ample fund in notes which might be applied in any manner it saw fit. He then proposed that the Government should borrow from the company 1,500,000,000 livres at an interest of 3 per cent. With this money the state creditors were to be paid; but the regent and Law both saw that the reimbursement might lead to the most serious consequences by flooding the market with bank-notes for which there was no demand. But if the shares of the company acquired a real or fictitious value far beyond their original cost, then all who possessed bank-notes would be eager to buy shares with them. In that event they would circulate rapidly and their credit would be maintained. "Thus," says Murray, "the credit of one fictitious value would be supported by that of another, and Law's scheme of issuing paper money practically inconvertible would be realized. Those who disliked bank-notes might exchange them for shares, and those who possessed shares might convert them into bank-notes."

The next step, therefore, was to raise the credit of the shares of the company. Many and various reports were circulated having this end in view. The public imagination was kept on the stretch by unceasing rumors of new discoveries, new contracts of one kind and another, which were calculated to excite the shareholders. The reports concerning the wonderful fertility and rich products of Louisiana produced an amazing effect. The shares rose to 1000 livres, to 10,000, and even 20,000 livres. A dividend of 40 per cent. was announced, though this was purely fictitious, but it had the desired effect of greatly enhancing the value of the shares. Law was continually starting new reports and perfecting his plans for enriching the company, which resulted in sending the price of the stock up higher and higher. As long as he could maintain general faith in the enterprise and enhance the value of the shares, there was nothing to fear. Persons bought the stock, not so much for its intrinsic value as with the expectation of its advancing in price and of selling out and pocketing the difference. They were eager to make their fortunes quickly, and they were sure of doing it so long as the stock kept rising rapidly.

Enormous fortunes were made by the rise, and some were wise enough to exchange their notes for specie or buy land with them and secure their gains. But the amount of bank-notes was swollen to an enormous extent, not much less than three milliards, and after a time people began to evince the disposition in a more marked way to convert them into property of real value. The usual course would have been to take them to the bank and demand specie. But Law had adopted so many precautions against this danger that the noteholders dared not make a run on the bank, fearing that it might lead to some act of authority protecting it from its creditors. But they could purchase land and other things. The result was, that prices rose enormously; if merchants sold their goods for paper money, they doubled or trebled their price.

Law saw what was coming. The first defensive step was the issue of an edict by the Government reducing the specified value of all the shares and notes issued one-half. The reduction was to be gradual, extending over a period of eight months. It has been questioned whether this edict was issued by Law's advice or against it; though, as he was now the comptroller-general and on good terms with the regent, it is hardly probable that the edict was issued contrary to his judgment. Anyhow, the edict produced a most disastrous effect. The owner of a bank-note found that in a single day its value had been reduced from 100 to 80 livres. In a few months it was to be reduced to one-half the original amount. A panic seized the public mind; the value of the bank-notes and shares rapidly declined; a run on the bank was inevitable; and, though the value of the specie belonging to it was raised from 65 to 120 livres the marc, thus nearly doubling its exchangeable power, the applicants were so eager and numerous to get even this depreciated coin that ten or twelve persons were crushed to death. Law's life was endangered, and his bold and gigantic enterprise collapsed more suddenly than it sprang into life. It yielded the poisonous fruits of a fearful demoralization from which France did not recover for a long period.[1]

Law's experiment had lasted only four years. The losses were so tremendous, and confidence in banking was so completely shattered, that no bank flourished there during the next fifty years. But in 1776, under the ministry of Turgot, a bank of discount was established at Paris. Its original capital was only 7,500,000 francs. Three years afterward its capital was increased to 12,000,000 francs. The rate of discount was fixed at 4 per cent. on bills of exchange having two or three months to run. Shortly afterward bank-bills were issued to the same amount as its capital. The activity which it imparted to the circulation during the American Revolutionary War was so great that commerce, in the opinion of the most enlightened merchants of the time, could not have supplied itself with silver at the rate of 6 per cent., which was the rate during the latter years of the war. Subsequently, the embarrassments of the bank were so great that it was suppressed in March, 1793, by a decree of the Convention. Various associations were afterward formed at Paris for carrying on the discount business, the most noted of which was the "Caisse des Comptes courants," which was founded in 1800 and almost immediately merged in the Bank of France.

The law of Sept. 24, 1803, granted to the bank a franchise for fifteen years; it was extended to twenty-five years by the law of April 22, 1806. Then a further extension of twelve years was granted in 1840. In 1852 the franchise was extended five years longer, and finally, on the 9th of June, 1857, its continuance was authorized till the end of June, 1897.

Its original capital was 30,000,000 francs; in 1803 the amount was increased one-half, and five years afterward the capital was increased to 90,000,000 francs. The surplus fund was at first used to purchase shares of the bank, and by 1812 its capital had been reduced to 67,900,000 francs in this manner. There had been 22,100 shares cancelled. The capital remained at this figure till 1848. Meantime, after 1820, the bank used its surplus in making extra dividends. From 1820 to 1831 more than 23,500,000 francs were thus distributed. In 1834 the reserve fund was limited to 10,000,000 francs, which was invested in public stocks. Since that date no additions have been made to the reserve from the profits.

On the 1st of January, 1849, 23,500,000 francs were added to the capital, resulting from the union of the provincial banks with the Bank of France. With this addition its capital was 91,400,000 francs. In June, 1857, the amount was doubled, but the bank was also required from the proceeds of the new shares to deposit 100,000,000 francs in the public treasury in exchange for an inscription of inalienable 3-per-cent. rentes of four millions a year. This transaction was completed at the end of 1860. This portion of the capital constitutes the reserve necessary for the redemption of the bills put into circulation. The limit of the circulation was fixed by the decrees of 1848 to an issue of 452,000,000 francs; in Dec., 1849, the amount was raised to 525,000,000; and in April, 1850, all restrictions on the amount were removed.

The original charter of the bank authorized the opening of local banks, but the act of April, 1806, and another passed two years afterward, restricted banking operations to a single central bank at Paris, with affiliated branches. Many attempts were made to establish such branches, beginning at Lyons and Rouen in 1808, but they were all suppressed by a royal decree in 1817. The same year Rouen established a local bank; in 1818, Bordeaux and Nantes obtained the same privilege. During the next seventeen years no others were established, but between 1835 and 1839 they were founded at Lyons, Marseilles, Lille, Havre, Toulouse, and Orleans. In 1848 all these local banks were reunited with the Bank of France. At the close of 1860 forty new branches had been established. The law of 1857 required that within ten years from that date the bank should have a branch in each department of France.

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[1] Several lives of Law have been written: Thiers' *Histoire de Law* (English trans., New York, 1859); *Memoirs of the Great Mr. Law* (London, 1721); *Life and Projects of John Law* (Edinburgh, 1791); Wood's *Memoirs* (Edinburgh, 1824); *Œuvres de J. Law* (Paris, 1790).

The governor of the bank is appointed for life. The general council, consisting of fifteen regents and three censors, is elected by the general assembly. This body consists of the two hundred largest shareholders, who represent the whole number. Five of the fifteen regents must be chosen from the manufacturers, traders, and merchants who are shareholders of the bank. Three of the regents must be chosen from the receivers-general of the taxes, who are the treasury agents in the departments. They are elected for five years, and the censors for three, and are re-eligible when their term of office is completed. The deputy governors rank among the regents, and take their places according to seniority. The censors are a sort of standing committee of audit. Their special duty is to watch over the operations of the bank. Among other things done by them they appoint a discount committee, which consists of twelve shareholders carrying on business in Paris. A fourth part of this committee is re-elected annually. They assist in the discount operations, in which they have a deliberative voice. The duty of the governor is to see that the laws which regulate the bank are executed. In the words of M. Rouland, a recent governor of the bank, it is his duty to see that "the bank performs its duty to the state and towards the commerce and industry of the country."

From the outset the bank was a Government institution, and was created rather to do the duty of a fiscal agent than to fulfil the demands of commerce. The creation of branches in all the departments was a favorite idea with the First Napoleon. In a grand progress which he made through several of the larger provinces in 1810 he expressed his desire to have a bank of discount in every city, and he promised the people that this should be done. He foresaw the great development which a uniform and ramified banking system would give to the business of the empire, but he did not perceive that while banks may encourage and stimulate business, it is not their province to create it; and the trade of the departments was not, at that time, considerable enough to give profitable employment to banking capital.

The policy of establishing new banks, which that great finance minister, M. Mollien, successfully resisted in 1810, was revived, as we have seen, in 1836. The industry and commerce of the departments had at length attained vast proportions, and the need of local capital for its further development was no longer doubted.

The Revolution of 1848 caused a suspension of specie payments by all the banks of issue. No special blame could be imputed to the provincial banks for yielding to a force which had proved too great for even the Bank of France. But the provisional Government seized the occasion to revoke their charters and to absorb them all in the national institution. There was no scrutiny into the relative value of their stocks and those of the Bank of France; their assets and liabilities were turned over to the latter, and the same number of its shares was issued to the provincial bank stockholders as they had held in those institutions. Thus the monopoly of the circulation was restored to the bank, and it has been exceedingly profitable.

Besides this monopoly of issue, the bank enjoys another privilege, which gives it great power over the money-market, making it, in truth, the monetary dictator of the country. This privilege consists in fixing the rate of discount and of interest on advances above 6 per cent., "if circumstances require it." The legal rate on commercial bills is 6 per cent., and the same limit governed the bank till the law of June, 1857, which authorized the bank to raise the rate at discretion. Though the law did not apply specifically to any other party than the Bank of France, the courts have decided that it applies to all banks and bankers discounting paper, inasmuch as they, being borrowers as well as lenders of money, are subject to the rates established by the bank. But the change in the law is less remarkable than the change in the practice of the bank with relation to the rate of discount. Prior to the act of 1857 the rate had remained almost inflexibly at 4 per cent. To maintain it at this rate was, indeed, a cardinal principle with the First Napoleon, who declared that there should be placed over the door of the bank in letters of gold this inscription: "The mission of the Bank of France is to discount all commercial bills at 4 per cent." But this rule could not always be observed. Between 1853 and 1857 the rate of discount fluctuated between 3 and 6 per cent., and since the latter date it has ranged from 3 to 10 per cent.

The object of raising the rate of discount is to check the discounting of paper, and thus prevent a drain of specie. The old method of doing this employed by the bank was to diminish the time of the paper discounted. There can be no question concerning the success of the modern practice. By making business operations more expensive their volume is reduced, speculation is checked, and the withdrawal and shipment of gold prevented. As the Bank of France has no competitor, borrowers feel its action more acutely than similar action on the part of the Bank of England. The plan of reducing the *échéance*, or period which bills may run, has been severely criticised. The check has been declared to be both injurious and futile. The bank, for example, takes bills at sixty days at 4 per cent., but suddenly refuses those of a longer date, though equally good. The unfortunate holder of the latter class of bills is obliged to seek discounts elsewhere. The consequence is a pressure among the commercial classes of the severest kind. It has often been not a question of rates, but of getting discounts at all. Now, what is the effect of this policy on the bank? It continues to give money to certain parties at 4 per cent.; others who hold bills equally good, but out of date for the bank, are giving 5, 6, 7, and 8 per cent. The holders of short bills discount more than they would otherwise have done, in order to obtain the high profit of rediscounting longer-dated bills; those who have deposits in the bank withdraw them, in order to obtain the large profits from private discounting; and, lastly, bills are drawn by parties in Paris, or from their correspondents in London and Brussels, of the necessary instead of the usual date, in order to evade the bank regulation. Thus, in every way the bank is defeated. The pressure on the public is greater; the drain on the bank funds is greater; the regulation, moreover, is easily evaded; while the bank gets no share of the advantages which a higher value of money offers.

The suspension of specie payments by the bank during the years 1848–50 is an event requiring further consideration. From the 26th of February to the 14th of March, 1848, the metallic reserve fell from 140,000,000 to 70,000,000 francs. The withdrawal of its resources had been going on for more than three years prior to the suspension of specie payments. During the year 1846 the accounts current fell from 118,470,000 to 61,565,271 francs. The treasury account during the same period was reduced from 95,149,737 francs to 48,296,647. Lastly, the new banks of discount had drawn heavily from the central establishment. The purchase of grain abroad and at home was the reason for withdrawing the accounts current. "This withdrawal," said the *Commerce* Paris newspaper in 1847, "would present no source of uneasiness as regards the reserve, had not the treasury been obliged to withdraw a great part of the funds which it had placed at the disposal of the bank. It was, no doubt, very convenient for this establishment to dispose of a sum of more than 100,000,000 francs for which it had no interest, whilst more than 50,000,000 of its capital of 67,900,000 francs were invested in rentes."

On the 15th of March, 1848, more than 10,000,000 francs were paid away in coin, and at its close only 55,004,000 francs remained in the bank. A year before it had borrowed 20,000,000 francs in silver of the Bank of England in order to increase the reserve. On the night of the 15th of March the decree of suspension was prepared. It declared the notes of the bank to be legal money, and relieved the bank from paying them until a further order was issued. But as notes not exchangeable for specie were in danger of being discredited, the maximum of their issue was fixed at 335,000,000 francs. The decree also ordained that the condition of the bank should be published every week in the *Moniteur* newspaper.

The decree also authorized the emission of 200- and 100-franc notes. Emissions for 50 and 25 francs had been demanded. But it was thought that, while they might facilitate payments in small transactions, they would stimulate the exportation of coin at a time when it was desirable to retain as much as possible. The demand, therefore, was not granted. After the suspension occurred, the bank continued to advance to banks of discount and general depositories—institutions soon to be explained—to a large amount, besides also advancing to the treasury at various times during 1848 and 1849 about 150,000,000 francs. Before the close of 1848 the condition of the bank stood thus: circulation, 375,000,000 francs, discounts, 150,000,000, and bullion, 350,000,000. The rise in bullion from 55,004,000 francs to such a figure within a year was very remarkable. It was the effect of substituting small notes for coin, and of the large balance of trade in favor of France, resulting from a diminution of imports and an increase of exports, amounting during the year 1848 to more than 250,000,000 francs.

In December, 1849, the circulation had reached very nearly 450,000,000 francs, and the metallic reserve was almost as great. The maximum of circulation was then extended to 525,000,000 francs. On the 6th of August, 1850, the National Assembly authorized the immediate resumption of cash payments. At that time the circulation was 500,000,000 francs, bullion, 450,000,000, and the discounts only 102,500,000 francs.

Discounts of commercial paper by the Bank of France are not granted unless three signatures are given. In the ordinary operations of buying and selling, the holder can offer only two names, his own and that of the purchaser. The inevitable effect of this provision, therefore, is that the merchant or tradesman must carry his note to a third party, usually a banker or broker, who, by affixing his own name, fulfils the requirements of the bank. This rule of requiring three names is defended on the grounds, first, that it forms a safeguard against the use of what is termed "accommodation paper," inasmuch as the difficulties in the way of making it are increased by this requirement; secondly, that by checking the discount of accommodation bills it prevents the expansion which they would cause in the circulation of the country.

In order to render the discount of bills easier, on the 7th and 8th of March, 1848, just before the suspension of specie payments by the Bank of France, *comptoirs d'escompte*, or banks of discount, were established. The capitals of these banks were subscribed, one-third in money by individuals, one-third in local securities by the cities in which they were respectively located, and one-third in treasury bonds by the Government. The capital of the Central Comptoir at Paris was fixed at 20,000,000 francs, divided into shares of 500 francs each. Its operations were confined to commercial paper payable in Paris or in the departments into which the country is divided. All other operations were forbidden. Only two signatures to the paper discounted were necessary. It could not run longer than one hundred and five days if payable in Paris, and sixty days if payable in the departments. The rate of 6 per cent. was fixed for all kinds of paper discounted, and interest was allowed on deposits.

At the time of their establishment, commerce was so inactive and business generally so depressed that there was a scarcity of commercial paper. But large stocks of goods existed in warehouses, which the merchants were obliged to hold or to sell at a great sacrifice. General depositories, therefore, were created under the control of the state, where manufacturers could deposit merchandise and the receipts taken were rendered transferable by indorsement.

In the first fifteen months of its existence, during the great commercial crisis of 1848 and 1849, the Central Comptoir d'Escompte discounted at Paris 244,297 bills, representing 192,455,260 francs. In 1854 it was empowered to make advances on stocks of industrial and credit enterprises for two-thirds of their value, at market quotations and for ninety days. The other comptoirs also have played their part in furnishing capital to French trade and industry. In 1854 the Comptoir received its final constitution, prolonging its privileges thirty years from the 18th of March, 1857. The comptoirs are enabled to extend their business very much by the Bank of France, which rediscounts their paper to a large amount. In the year 1848, when this was first done, the Bank of France discounted 87,500,000 francs of their paper in Paris and 145,000,000 francs at the branches. It also made advances on the receipts of the general depositories to the amount of 62,500,000 francs.

The effect of the Franco-German War was to swell enormously the circulation of the Bank of France. The Government gave its bond to secure the issue of 1,400,000,000 francs. At the outbreak of the contest the bank held a bullion reserve of 1,318,000,000 francs, but in December the reserve had fallen to 497,200,000. Although nominally inconvertible, the notes were not at a discount.

The following table, showing the quantity in circulation January 30, 1879, of the different kinds of notes, is instructive:

Value, francs.	No. of notes.	Amount.	Ratio.
5,000	5	5,000	.00
1,000	1,382,379	276,478,250	60.35
500	753,599	75,359,900	16.45
200	3,087	123,480	.02
100	5,046,031	110,920,620	22.02
50	316,166	3,161,660	.69
25	29,525	147,625	.03
20	426,537	1,706,150	.38
5	206,653	206,650	.04
Old issues,	1,245	87,280	.02
	8,165,227	468,196,615	100.00

Checks are not used so generally in France as in the United States. This may be illustrated by the following transactions of the Bank of France for the years 1877 and 1878:

		1877.	1878.
Accounts paid by	checks,	55.11 per cent.	57.70 per cent.
"	bank-notes,	39.56 "	39.56 "
"	coin,	5.33 "	5.33 "

The bank now maintains eighty-six branches, one of which is in Algeria. Some of them are carried on at a loss.[1]

Banking in Germany.—One of the great banks of Europe is the Reichsbank, or Imperial Bank, of Germany. This has some peculiar features. While describing this we shall also glance at the previous history of banking in Germany.

Before the Franco-German War of 1870–71 the banks of the various German states issued bank-notes subject to regulation by each state. But by far the largest bank was that of Prussia, which was afterward merged into the Imperial Bank of Germany. It was divided into three parts: the principal bank, the deposit bank, and the loan or discount bank. The principal bank was founded in July, 1768. It had power to purchase and sell gold and silver, bills of exchange, to issue notes, to receive the Government money remitted from the provinces, to pay the salaries and expenses of the diplomatic agents at foreign courts. The deposit bank received, in exchange for debentures certified by the authorities of the principal bank, the funds belonging to orphan establishments and to charitable institutions generally, and the money of individuals from 50 rix-dollars upward. The money thus deposited might be withdrawn after a week's notice, the repayment being made at the principal bank. The fixed rates of interest after 1787 were 2 per cent. for money belonging to individuals, and 2½ per cent. for that of charitable institutions, except orphan establishments, which drew 3 per cent. The loan or discount bank lent money on goods not of a perishable nature, and discounted bills of exchange having three good indorsements. The lowest value on which money was advanced was 100 rix-dollars currency. The interest was payable in advance, and the money was lent from two to six months.

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[1] Alph. Courtois, *Histoire des Banques en France.*

Such is the outline of the Bank of Prussia, which was the foundation of the greater bank established in 1875. The governing body consists of a council of administration, called the "bank curatorium," who are appointed by the Government. "The president of the council is the chancellor of the empire and he has four paid colleagues." One of these four members is named by the emperor, the other three by the federal council. The council meet quarterly, and receive a report of the condition of the bank, and of all matters pertaining to it. In some regards the imperial chancellor acts alone. He directs the entire administration of the bank under the rules prescribed in the banking law; he publishes the directions for the bank directory and the branch offices, and also the rules and instructions for the officials of the bank. He alone is authorized to introduce a change in any of these regulations. The charter runs twenty-five years, and is renewable for ten-year periods.

The Imperial Bank directory is the official authority by which the bank is administered. It consists of a president and a certain number of members; its decisions are made by a majority of the members present. It is subject to the directions of the chancellor of the empire with respect to all questions of administration. The president and members of the bank directory are appointed for life by the emperor.

So far as the shareholders are concerned, they have the right to be present at the annual meetings and to take part in the proceedings. They are also represented in any business connected with the administration by a central committee chosen from their number and consisting of fifteen members and as many substitutes. The central committee hold monthly meetings, to which must be submitted the weekly reports relating to discounts, bills, loans, the note-circulation, cash in hand, deposits, purchase and sale of gold, bills, and securities, and the distribution of funds to the branch offices. The continuous special control over the administration of the bank is exercised by three deputies chosen from the central committee, who hold office for a year, and by three substitutes for the deputies. The deputies are entitled to be present and to pronounce their opinions at all the meetings of the bank directory. They have also the right to examine into the course of business, the books and securities, in the presence of a member of the bank directory. Such is the elaborate method devised for conducting the business of the bank.

The Imperial Bank has 210 branches, located in all parts of the empire. The regulations concerning the issue of notes are unlike those existing in any other country. Although several features of the Italian system have been copied, and others from the system existing in the United States, the regulation of the note-issues is by a new principle. A certain amount can be issued without taxation, but beyond this limit a tax of 5 per cent. per annum is imposed. The end sought to be attained by this regulation is to keep the issues within a certain amount usually by making the excess unprofitable, yet providing a way for increasing them on extraordinary occasions. In the closing week of 1881 this regulation came into operation for the first time with respect to the Imperial Bank.

The notes issued by the German banks must be covered, one-third at least, by German coin, by legal-tender notes of the empire, by gold bars or foreign coins valued at a certain rate, and the remaining two-thirds by discounted bills due at latest in three months, and for which generally three, but at least two, persons known to be solvent are responsible. Although the banks may thus issue their notes to the extent prescribed, yet when their issues exceed a certain amount, as we have remarked, a tax of 5 per cent. must be paid. This restriction is regulated by the ninth section of the banking law. It permits an issue free of tax to such an amount of cash, notes of other German banks, gold bars, and foreign coin, as may belong to the bank, in addition to an amount covered by bills, originally limited to 250,000,000 marks for the Imperial Bank, but subsequently increased by the transfer of issues from other banks to 273,875,000 marks. These additional issues are put forth under a provision of the law which declares that if any bank forfeit its right of issue by the lapse of its charter, renunciation, bankruptcy, sentence of a court of justice, or decision of a state government, the amount of its authorized issue shall lapse to the Reichsbank. Besides the 15 banks whose issues have thus lapsed or been transferred, there are 18 other banks, whose issues amount to 111,125,000 marks.

The right of issuing notes is conferred by law. They are not a legal tender, nor can any province of the empire pass a law requiring the imperial treasuries to receive them in payment. They are not issued for smaller sums than $25; and every bank must cash its notes at full value at its head office, and also at its branches. No bank can call in its notes without an order of the federal council. The Reichsbank can issue notes according to its business requirements under the control of the imperial debt commissioners, and the notes of other banks organized and existing under the law of 1875 are a legal tender to the Reichsbank and its branches. The circulation of private banks of issue is restricted to the states in which they are situated, unless they conform in business management to the rules prescribed for the banks just mentioned; they must accept, too, the notes of all authorized banks. Lastly, all banks of issue are required to publish in the *Gazette* a weekly statement of accounts and their annual balance-sheet.[1]

Banking in Austria-Hungary.—On the 24th of December, 1867, a forced currency was established. The empire, having contracted various liabilities to the National Bank then existing, finally consolidated them into a loan of $40,000,000, which was accepted by the bank without interest in consideration of securing a reorganization under the name of the Austro-Hungarian Bank, with a charter extending to the end of 1887, and conferring the exclusive right of issuing bank-notes for the empire. They are covered by the assets of the bank in the manner provided by law, and have a priority over other claims in the event of liquidation, but are not secured by the credit of the state. The notes are payable to the bearer on demand, and are not issued for sums less than $5. They are payable in coin of the realm at its head offices at Vienna and Buda-Pesth. If not paid within 24 hours from the time payment is demanded, further issues are immediately prohibited and the bank forfeits its charter. The same strictness, however, does not prevail with reference to redeeming its notes at its branches, which are numerous. It must redeem them in legal-tender money at these places so far as its resources will admit, but the requirement ends here. The charter, however, contains another important provision—namely, the issues over $100,000,000 must be covered by gold or silver coin or bullion, a requirement evidently taken from the constitution of the Bank of England. Furthermore, any notes issued against liabilities on demand—that is, deposit accounts in excess of the amount of the reserve of the bank—must be secured on banking securities. These may consist of bills and notes discounted by the bank, loans on precious metals or convertible notes, redeemable obligations or coupons of the empire, and foreign bills of exchange. If experience should show that the amount of security-covered bank-notes is not enough to supply the demand for them, the bank may state the situation to the Government, and it has authority to direct the issue of more. Any notes outstanding after six years' notice to present them for payment are to be written off the circulation. They must be accepted in all payments in the absence of any special agreement.

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[1] A translation of the German banking law may be found in the *Bankers' Magazine*, vol. xxx. p. 301.

The administration of the bank consists of a board of directors, a governor nominated by the emperor, two deputy governors elected by the board from their own number for three years, and twelve directors elected for a similar period by the shareholders and confirmed by the emperor. The general assembly of shareholders consists only of those who own 20 or more shares, and who are Austrian subjects. They elect a committee of 12 members, who examine the accounts of the bank and have a decisive vote in the deliberations of the directors respecting a proposed change in the rate of discount. An imperial commissioner also is attached to the bank, whose duty consists in watching the business of the bank in order to detect or prevent any violation of the laws relating to it. A close resemblance may be seen between the constitution of this institution and that of the Bank of France.[1]

Swiss Banking.—The Swiss banks are divided into two classes. They are either cantonal or joint-stock banks, and are limited in their liability. The Concordat banks are associated under a mutual agreement made July 8, 1876. It is an agreement to accept each other's notes and interchange business under a kind of clearing-house arrangement. All the larger banks are thus united, except two whose locality or lack of capital prevents them from joining. The issue of bank-notes in most of the cantons is free, though sometimes a tax is imposed from one-half to 1 per cent. on the maximum issue. The limit of circulation is not absolute, but is regulated by the necessity of maintaining in some cases one-third of the total issue in coin, in others it must bear a fixed maximum proportion to the capital of the bank. The note-circulation is not in any case specially secured, but is, like the whole of the liabilities, covered by the collected assets. In the event of liquidation the note-holders have no preference over other creditors. But with respect to the cantonal banks the credit of the canton is pledged to cover any deficit that may happen in their payment. The canton also furnishes a part or all of the capital, and gains both by the currency-taxation and by the working of the bank. The cantonal bank is therefore a state bank. The notes issued by the non-Concordat banks are generally restricted to the immediate locality in which they are issued, since they are comparatively small in importance and have no agencies out of their own district. The Concordat bank-notes circulate freely throughout the country, and are accepted in payments on Government account, though bank-notes are not anywhere in Switzerland a legal-tender, and the constitution prohibits any legal obligation to accept them in payment.

Banking in Italy.—In Italy the chief banking institution is styled the National Bank of Italy, and was founded in 1859. It was composed of two banks—the Bank of Genoa, founded in 1844, and the Bank of Turin, established three years afterward. When the National Bank was organized it was stipulated that an annual payment of a certain sum should be made for Government superintendence over the institution; a weekly account must be rendered by the bank and its branches, showing the amount each Saturday on hand in specie and bank-notes, the amount of the latter in circulation, the balance of accounts current or deposits in its control and those not disposable, and the general balance. The bank was required to advance to the state against a deposit of public stocks or treasury bonds a sum not above 18,000,000 lire, at 3 per cent. interest, or less if the market rate were lower.

The original charter established three bank-seats and four branch banks, and authorized the association to remain in operation until the end of 1889. The capital was fixed at first at 40,000,000 lire, and was increased in 1870 to 100,000,000, and six years later to 150,000,000 lire. It has established branches throughout the country, and its circulation consequently is received everywhere in the kingdom. The Italian bank of next importance is the Bank of Naples.

In 1866 a forced paper currency was established. As specie was banished by the adoption of this policy, the banks were led to issue small notes in large quantities.

In Central and Upper Italy, where there was no banking corporation of equal weight with the southern banks, the great difficulty of supplying small change for daily needs led to the issue of a flood of unsecured paper. This "illegitimate" issue, stimulated by speculation, grew very fast, and in 1869 and the following year the attempt was made to sanction free trade in the issue of paper money by the banks, but it did not prove successful. In December, 1872, the National Bank obtained authority to issue $2,000,000 in $5 notes, and the Banks of Rome and Naples considerable sums of a small denomination. The effect of this movement was to reduce the illegitimate circulation, which was still further contracted by the action of the Government directing the various classes of issuing associations to withdraw their illegitimate issues. But this measure could not be rigidly enforced; the situation did not favor the thorough execution of the order. In 1874, however, the situation had so far improved that a law was enacted for retiring the paper of unauthorized institutions, savings banks, chambers of commerce, and "monti pri" by the end of the year; of commercial banks by June, 1875; and of credit companies, agricultural and popular banks by the end of the latter year. This law was executed, though in withdrawing the issues of credit companies and those of agricultural and popular banks no little difficulty was experienced.

Banking in Russia.—Next may be mentioned the Imperial Bank of Russia. It was founded in 1860, in imitation of the Bank of England and the Bank of France, to regulate the issues of currency and give aid to commerce. This bank was "founded by the state, and is conducted under the supervision of the state, its directors being a committee of the treasury and its capital subscribed by the Government." Its charter runs for 28 years, and the bank has numerous branches. Its capital when founded was $11,875,000, and one of the prime objects of organizing the institution was to restore specie payments, from the absence of which the country was greatly suffering. During the year 1863–64 the paper rouble rose steadily to par under the system adopted, but this result was "only achieved by permitting a drain of bullion to take place on such a scale that a forced circulation had again to be adopted, in November, 1873." At this time a circulation of the nominal value of $630,000,000 was based on a reserve of only $43,330,000 in specie. The Turkish War of 1877–78 caused an immense increase in the circulation. Besides this bank and its branches there are more than 200 communal banks, but these latter issue no notes. Their issue therefore constitutes a monopoly enjoyed by a single bank of the empire.

Early Spanish Banking.—Before closing our account of foreign banks, something must be said of the older banking institutions of Spain. Spanish writers have sometimes supposed that the Bank of Barcelona was the first banking institution founded in Europe. Its origin dates from 1401, and therefore, while not the oldest, it properly forms a triumvirate with the Banks of Genoa and Venice. It was established by the magistrates of the city, and was a bank of exchange and deposit. It was called Tabla de Cambi ("Table of Exchange"). It was founded on the security of the funds of Barcelona, and extended its accommodation to foreigners as well as to its own citizens. It appears, from records still extant, that foreign bills of exchange were usually negotiated in it, and that the directors gave assistance to the manufacturers when making their purchases of raw materials.[1]

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[1] Wirth, *Handbuch des Bankwesens.*

In 1781, Cabarrus, the Spanish finance minister of that day, proposed a plan for a national bank. One was organized, called the Bank of San Carlos. The capital consisted of 300,000,000 reals, divided into 150,000 shares. An office was established at Madrid to discount bills drawn on that city. The profits of the bank were to be derived chiefly from a contract for provisioning the army and navy. Previously, the *gremios*, or associations, had made and executed these contracts with the Government, and at the time of forming this bank a contract was expiring. It was in the power of the bank, therefore, to make such a contract at the very beginning of its existence.

Besides the capital thus derived, the projectors of the bank expected to receive considerable funds in other ways. It was proposed to add the profits of the *real giro*, a kind of treasury from which the court drew the funds that were sent abroad. Besides, it was expected that much of the capital which had been deposited in the *gremios* would be diverted to the bank. The overplus of the grants of the communes was administered by the council of Castile. These were added to the funds of the bank. There were at this time in almost every community of Spain magazines for grain, the surplus of which was converted into money. This fund went into the bank also.

"The bank obtained a grant after its establishment of being exclusively charged with the extraction of the piastres. It is well known that the portion of this money which did not remain in America, and was not extracted by smuggling, arrived in Spain to pay for all sorts of merchandise which that country had received from strangers. The bank took possession of its privilege in November, 1783. The first use it made of it was very advantageous. The return of peace produced a prodigious circulation of piastres. In 1784 the bank exported to the amount of more than 20,000,000 piastres, and in 1785 nearly 22,000,000, the revenue gained by this arrangement. The duty on the extraction of piastres had never produced more than 6,500,000 reals; in 1784 it exceeded 15,000,000, and in 1785 exceeded 16,000,000. The single article of piastres produced a profit of near 12,000,000 reals," which was divided among the shareholders. The contract for provisioning the army and the navy was obtained, and the first dividend declared in 1784 was 9½ per cent. Four years afterward, Cabarrus thought of a new source of profit by connecting the bank with the Company of the Philippines, which he had just formed. In 1785, Larena, who had succeeded Cabarrus in the ministry, deprived the bank of its contract for provisioning the army and navy, although the agreement stipulated that it should last three years longer. This had the effect of discrediting its shares, which were still further reduced during the war with France. Notwithstanding this reverse, it continued for many years to make handsome profits.[2]

Review of European Banking.—From this review it will be seen that European banking has had a very regular development. The first fully-formed banks, Genoa and Venice, were established for the double purpose of assisting the state and creating a money standard which should facilitate commercial exchanges. Both institutions were successful in accomplishing these ends. They always paid, during their long and splendid history, in good and true money, what they promised to pay. The banks of Amsterdam, Hamburg, and Nuremberg were afterward formed for a commercial purpose. The service they rendered to the state was of less importance than that of furnishing a monetary standard. They also were successful in fulfilling the object of their creation.

We now come to a later period, when the Bank of England was founded in 1694. The prime object in forming it was to assist the Government by lending it funds. Then followed Law's bank, which had the double object of aiding the Government and furnishing a standard of money, the coins of that date being of very uncertain value in consequence of the frequent alteration of the quantity of metal contained in them. A third object which Law had in view was to furnish a larger supply of money, which he believed the people greatly needed. They did, indeed, need capital, but his paper notes were not capital—an unwelcome fact soon found out. The Scandinavian banks of Europe had in view the aiding of the Government and the furnishing of money to the people; and this has been the case very generally with all the European banks now existing. It may be added, however, that the power to issue bank-notes has been narrowing to a single institution in every state, controlled more and more completely by the Government. Thus, the Bank of Norway has the exclusive privilege of issuing notes for that kingdom; the note-circulation, as we have seen, in Sweden is divided between the Bank of Sweden and private banks; the issue of bank-notes in Denmark is confined to the Bank of Copenhagen, in the Netherlands to the National Bank, in Spain to the Bank of Spain. In Portugal there are several banks of issue, but the Bank of Portugal, which is the leading establishment of the country, regards the issuing of notes by any other banking establishment as an infringement of its rights. But the circulation of no bank goes far, distrust in bank-note redemption is general, and payments outside the cities or the immediate vicinity of the places where such notes are issued must be made in coin. In Germany, France, Italy, Austria-Hungary, and Russia we have seen how centralized the issue of bank-notes has become. It is essentially a function delegated to the banks not as a favor or privilege, but in return for loans or other assistance rendered to the state. It thus forms a marked contrast with the system existing in the United States, which is soon to be described. Another feature hardly less noteworthy is the greater security now required for the circulation of bank-notes. It is true that in Russia there is an enormous issue without anything to sustain it except the credit of the Government, which is poor, so that the notes of the bank are greatly depreciated; but elsewhere bank-circulation for the most part rests on a sound basis, and a very different one from that which the brilliant though lawless Law devised. Great progress has been made, therefore, in this regard. As for furnishing assistance to those engaged in trade, commerce, and manufactures, a similar improvement has taken place in utilizing capital and putting it within reach of the classes needing it. Where state banks could not do this effectively they have been supplemented by other institutions, notably in France and Austria-Hungary. The growth of these secondary institutions has been most remarkable. Lastly may be noted the greater economy in the use of money by means of checks. In Europe this system has been most completely developed in Great Britain; admirable as the banking systems of France and some other countries are in many ways, the people have yet much to learn and gain in the use of these instruments.

BANKING IN THE UNITED STATES.

Colonial Banking.—Several banking schemes were launched by the colonies previous to their separation from Great Britain. They have often been regarded as quite original undertakings, but read in the light of the history already given it will be seen that our fathers merely trod in the footsteps of their predecessors. The first discussion about establishing a bank occurred in Massachusetts in 1652. The colonists may have broached the subject earlier, but we can find no trace of their having done so. Not satisfied with the mode of obtaining an increased medium of circulation for the purposes of traffic, the people of that colony seriously thought of establishing a bank and issuing paper money. Another reason which impelled them was the bad state of the currency—just what had led the people of Venice and Amsterdam to establish a bank centuries before. The matter was brought before the legislature, and the following was the conclusion of the report by a committee to that body: "What hath bin thought of by any for raising a Banke or engaging in generall trade or relating to monies in regard of the badnesse of it, or highnesse or lownesse of it, with very many other matters tending to the promoting and well regulating of trade, will by this means be inferred, and things reduced to a more comfortable state than we now find."

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[1] Capmany's *Mémoires de Barcelona.*

[2] See Coxe's *Memoirs of the Kings of Spain of the House of Bourbon*, vol. 5, and Appendix 26 to same; Massuet's *Life of the Duke of Ripperda*, Amsterdam, 1839; Santillan, *Memoria Histórica sobre lo Banco Nacional de San Carlos.*

Thirty years passed, and then we hear Gov. Dudley and his council saying that it had been suggested to them that the "delay of trade, obstructions to manufactures and commerce in this country, and multiplicity of debts and suits thereupon, principally occasioned by the present scarcity of coyne," could be remedied by supplying bank-bills, "or credit given by persons of estate and known integrity and reputation." The governor remarked that other countries had found their banks useful "to their great flourishing in trade and wealth." Bank credit or bills were of "greater value than ready money there." John Blackwell and others had indeed made a proposal for establishing a bank, and these remarks of the governor and council were in reply to the proposal. Liberty was granted for the directors or "conservators" of the bank to issue bills on the security of real and personal estate and imperishable merchandise. This was in 1686. The project gave no offence to the Government. At the time of authorizing this bank men were earnestly discussing the expediency of establishing a national bank in England. In 1701 the General Court proposed a bank to be owned by responsible men, but the recommendation was negatived by the council. Eleven years afterward Coleman's scheme came before the public. His bank was to be based on real estate. The idea was doubtless obtained from Hugh Chamberlayne's plan, which had been laid before the British Parliament in 1693. Macaulay describes the plan in his usual graphic manner. He says, "The doctrine of the projectors was that every person who had real property ought to have, besides that property, paper money to the full value of that property. Thus, if his estate was worth two thousand pounds, he ought to have his estate and two thousand pounds in paper money." Notwithstanding the absurdity of the plan ought to have been apparent to "the most illiterate clown that could be found on the benches," a committee of that body reported the plan to be practicable. But Parliament opened its eyes before further action was taken, "and the country was saved," adds Macaulay, "from a calamity compared with which the defeat of Landen and the loss of the Smyrna fleet would have been blessings."

One inducement held out by the projectors of the colonial bank was that, if allowed to establish it, they would aid in erecting a bridge over Charles River. But a critic of the time said that this was "next to building castles in the air." Even if forty or fifty thousand pounds were spent in the enterprise, it was regarded as uncertain; for, says this writer, "I can't learn of a fast-bridge over such a river where there is such a stream in the whole world." What if he could see the bridges of our day? Coleman argued that the establishing of such an institution would not lessen the coin, for it was sent off as freely before bills of credit were issued as it had been subsequently. He also declared that unless there could be issues of notes from private companies, as well as from the public treasury, it was the general belief that greater depressions would happen. But the scheme encountered no little opposition. It was severely censured as a South-Sea bubble, a Pandora's box, and an infringement of the royal prerogative. Nevertheless, a considerable number of men met for the purpose of taking the stock of the proposed bank and preparing rules for its management to be laid before the General Court for its approbation. Seeing that the bank was likely to be established unless prevented by the legislature, the province council held a convention and ordered the projectors not to proceed to print their scheme or emit any bills before laying their proposals before the general assembly of the province. Thus cautioned, the patrons of the affair issued the following notice: "Whereas, the trade of this province is very much embarrassed for want of a medium of exchange, and an expedient being proposed to ease this difficulty by circulating bills or notes founded on land security, considerable sums being already subscribed, there will be attendance at a place designated to complete the subscriptions for the enterprise." In less than two months directors were chosen, and the institution went by the name of the Land Bank. The legislature sought to counteract the institution by making a bank of the province itself and issuing bills bearing interest. Bills to the amount of £250,000 were authorized of the same tenor as those already existing, which were to be put into the hands of five trustees and let out at 5 per cent. on safe mortgages of real estate, one-fifth of the principal, with the interest, being payable every year. Though the loans were restricted as to time, Felt says that some of them were continually renewed, so that they were out over thirty years. No person could borrow more than £500 or less than £50. The income was to be applied toward paying the public expenditures.

In this way the legislature sought to supersede the private concern. In order to make its destruction certain the legislature "ordered that no private company or partnership proceed to the making or emitting of any bills of credit as a medium of exchange in trade, without the allowance and approbation of the Court." But the mercantile portion of the community were not satisfied with the action of the Government in authorizing a loan of its credit. They thought it had not done enough. Accordingly, they petitioned for providing a more abundant medium of exchange in trade. The supporters of the Land Bank still held their ground. The governor himself had formerly been the promoter of a similar scheme; now that he was opposed to them, they labored for his removal. He was succeeded in 1716 by Gov. Shute, on whose recommendation that efforts should be made to revive trade, an additional loan of £100,000 was made by the province. The effect of making this loan, however, was to depreciate the paper currency of the colony.

Meantime, the notes of the private bank crept into circulation. In 1733 its bills in circulation amounted to £110,000, and were redeemable, says a committee of the legislature who made a report at that time on the subject, in ten years, with silver at 19 shillings an ounce, which was then the common rate of the province paper. They were regarded at that time as better by 33 per cent. than the province bills.

Moved by public opinion, a company in New Hampshire concluded to found a similar banking institution. The legislature of Massachusetts, learning of the enterprise, passed a law against the circulation of the bills in that colony. "This," says Felt, "was a banking speculation which promised much advantage to its promoters, but very little to the public. The large amount of its paper, like all such currency of that day in New England, reached Boston, the great mart for the Northern colonies. But, placed under the ban of the law, its market was spoiled for this province."

Although the Government exerted all its energy and wisdom to kill the Land Bank, the institution flourished. Learning that the military corps encouraged its circulation, the governor issued a proclamation against their so doing. The next important movement was to require the stockholders to give bonds, so that the public should not be injured by taking the notes of the bank. The governor informed the representatives that petitions had been presented to the king and Parliament for its immediate suppression, and proposed that they should pass a law to that end. But the bank had become popular, and they preferred to follow the public wish and suffer it to continue its operations. The governor did not abate his efforts to suppress the concern. Parliament then came to his assistance. The act passed in 1720, commonly called the Bubble Act, was extended so as to cover the plantations in America. The supporters of the bank did not discontinue its business even now. They defied the act of Parliament. In a letter written by Gov. Belcher in May, 1741, he said, "The Land Bank concern openly defy the act of Parliament, are now combining to raise a rebellion, etc. I have this day sent the sheriff and his officers to apprehend some of the conspirators. The Land Bank does so affect every affair in the assembly and throughout the province that it will be the ruin of the Government and people if it be not speedily and effectually crushed." The influence of the bank in the assembly grew more and more potent.

Finally, the tide turned against the bank. The action of Parliament, followed up by the vigorous efforts of the governor, and the confusion into which its affairs had fallen, led to submission. A committee of the legislature was appointed to settle its affairs, but a long time elapsed before the labor was completed. Again and again it makes its appearance like a spectre in the hall of legislation. In the end, the directors and many of the stockholders lost very heavily, and its affairs were not entirely closed until 1768. The last claim made upon the directors was for £1,500, and the records of the General Court do not show what action was taken about requiring payment. Felt says the probability is that the directors or their heirs discharged this balance. Though the institution possessed only a small capital, it played a considerable part in history.

In 1740, Edward Hutchinson and partners formed a specie bank. The notes were to be redeemable in 15 years with silver at 20 shillings an ounce, or gold *pro rata*. This was on the same plan in other respects as the other, and its bills were denominated "merchants' notes." The object of promoting it, Felt says, was to put down the other. In the legislature there was a diversity of opinion respecting these rival companies. The council expressed a wish that the Land Bank be disannulled forthwith, but that the silver scheme, as it was called, be put over to the next session. The representatives, regarding the Land Bank as designed for people of moderate means as well as the rich, manifested their desire that both should suspend operations until the next general assembly. This course was finally taken. At this time several other banking schemes were projected; indeed, men seemed very generally to be infected with a mania for banking experiments. One company in Essex county applied to the legislature for leave to issue £50,000 of notes on land securities. Another was proposed by residents in Scituate and neighboring towns, and a third in Middlesex county. These applications were not favorably considered.

The governor and Parliament sought to suppress the Specie Bank as well as the other. The committee who were appointed by virtue of an act of Parliament to collect and consume "all the notes of the silver and manufactory schemes" reported, on the 30th of June, 1742, that the Specie Bank had emitted £120,000 in notes and recalled £69,361, leaving the balance in circulation. It then disappears from history, and the probability is that its bills were soon discharged, while those of the older institution were to remain outstanding for several years before reimbursement.

The experiment of making colonial loans was not very satisfactory. In many cases borrowers were slow in paying. In 1740 the Massachusetts colony made a determined effort to collect the arrears of delinquents. "Much litigation and great loss accrued to many, who had mortgaged their estates for such debts." In 1712 South Carolina engaged in a similar experiment. Forty-eight thousand pounds were issued, called bank-bills. They were lent on bonded or personal security for a year, the colony promising to pay $4,000 yearly until the amount was redeemed. In Pennsylvania, where essentially the same plan was tried, the result was more satisfactory than in any other colony.[1]

Bank of North America.—The next bank was that of North America, established by Congress and chartered simultaneously by several of the State legislatures during the anxious days of the Revolution. Robert Morris suggested the establishing of it soon after he assumed the duties of his office as superintendent of finances of the Confederation. Alexander Hamilton had previously favored the trial of this experiment, and in a letter addressed to Morris early in his official career had laid all the details of a plan before him. Morris's plan was speedily approved by Congress, and as soon as the subscriptions were filled the bank was incorporated under the name of "The President, Directors, and Company of the Bank of North America." The States were requested to pass laws forbidding the establishment of any rival institutions during the war, and declaring that its notes, which were payable on demand in gold and silver, should be receivable in payment of taxes, duties, and debts due to the United States. The capital was $400,000, which could be increased to $10,000,000, and the right of inspection was given to the superintendent of finances. Morris relied for a supply of coin on the governor-general of Havana, who was to be repaid by annual shipments of flour guaranteed by France; but the first condition of the engagement was never fulfilled. When the bank began operations, the amount of specie in its vaults did not exceed $40,000, and the fear of an early exhaustion of this sum was so great that persons were employed during the critical period of its existence to follow those who demanded specie and urge them to return it. Notwithstanding every effort to make the issues of the bank safe, they circulated in the beginning from 10 to 15 per cent. below par in the Eastern States, and if Morris had not taken immediate measures to create a demand for them, and prevented further issues from going thither, their value would have been lost. Once gone, this could not have been easily restored, after the recent costly experience of the people in circulating paper money. Morris's efforts, however, were immediately successful. The issues of the bank rose to par, at which point they were sustained without further difficulty. This was the first bank established in the country which had redeemed its bills in specie on presentation.

As soon as the bank was opened, Morris wrote to the governors of the States declaring his confidence that, with proper management, the institution would answer the most sanguine expectations of those who had befriended the undertaking. Besides, it would facilitate the management of the finances of the United States. "The several States may, when their respective necessities require and the liabilities of the bank will permit, derive occasional advantages and accommodations from it. It will afford to the individuals of all the States a medium for their intercourse with each other and for the payment of taxes, more convenient than the precious metals, and equally safe. It will have a tendency to revive both the internal and external commerce of North America, and undoubtedly will be infinitely useful to all the trades of every State in the Union, provided it is conducted on principles of equity, justice, prudence, and economy."

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[1] Felt's *Historical Account of Massachusetts Currency*; Douglas's *Discourse concerning the Currencies of the British Plantations in America*, Boston, 1740; *Account of the Land Bank, or Manufacturing Scheme, and the Silver Scheme in Massachusetts*, Boston, 1744; Douglas's *Summary*, Boston, 1749, 1751.

Notwithstanding its early trials, the bank surmounted them, ministered effectively to the Government, and furnished the country with a safer and more convenient medium of exchange than even specie. In the third year of its existence its cash account arose to 5,957,000 Mexican dollars. Notwithstanding the attacks made on the bank during the succeeding year, "such was its great internal strength and the energy of its very nature" that its transactions amounted nearly to $37,000,000; indeed, its success endangered its life. Others wished to share the fat dividends, and when the directors refused to increase the capital of the bank, the erection of a rival institution was proposed. This was in 1784. The directors of the old concern were stoutly opposed to the scheme, and prophesied direful consequences if two banks attempted to transact business in Philadelphia in opposition to each other. "Two shops to go to," was the phrase of the day. The excitement ran high. The assembly of Pennsylvania was "plagued with long arguments on both sides," but "all at once the thing was hushed up and accommodated." The directors consented to increase the capital from $400,000 to $2,000,000, and allow the projectors of the new enterprise to become stockholders in the other.

No sooner was this contest settled than another and still fiercer was forced on the bank. A numerous party arose in Pennsylvania who demanded the issue of more paper money by the State, as had been done by the colonial land office before the War of Independence. "But unless the bank would give it currency, which everybody saw plainly enough the directors could not do," a new paper issue could not be created, as the State was powerless to put forth one having the confidence of anybody. The bank, therefore, was regarded as the opponent of the paper-money scheme, the friends of which, unfortunately, were powerful enough to procure, by way of revenge, a repeal of the charter in September, 1785. The bank, however, possessed other charters from several States, under which it continued to do business. Confidence, though, was somewhat shaken by the action of the State in repealing the charter, and its stock fell to 6 per cent. below par. As one charter was from the State of Delaware, a removal to Wilmington, New Castle, or some other place in that State was seriously contemplated. Finally, after several efforts to procure a renewal of the charter, the legislature granted one, though quite unlike the first. In 1789, when the Federal Government was formed, the bank was invited to take on a national charter, but it preferred to remain a State institution. From this period its history will be considered in connection with that of other State banking institutions.[1]

First United States Bank.—At the time Hamilton recommended the formation of a national bank there were but three banks existing in the country, their aggregate capital being about $2,000,000. Their bills were not a legal tender, and only a meagre supply of gold and silver existed in the country. The Government daily suffered for the want of more money. So long as the Government could use only gold and silver, and was without a national bank, considerable expense and difficulty would be incurred in transferring money from place to place. A national bank, therefore, was imperatively required that should fulfil these purposes, as well as many others, among which may be mentioned the temporary lending of funds to the Government. The bill for establishing it was debated chiefly on two grounds—its constitutionality and its expediency. Before signing it the President asked for a written opinion from each cabinet officer concerning the first point. The cabinet was equally divided. The capital was fixed at $10,000,000, for one-fifth of which the Government could subscribe. Its existence was limited to 20 years, and it was forbidden to charge more than 6 per cent. interest. The subscriptions of individuals were payable one-fourth in gold and silver, and three-fourths in the 6 per cent. stocks of the Government then bearing interest, or in 3 per cents. at one-half their nominal value. The bank was authorized to establish offices of discount and deposit in the several States, and its notes were to be received in payment of dues to the Government. It was authorized to sell the Government stock received for subscriptions, but not to become a purchaser. Of the capital, $5,700,000 was reserved for the chief bank, which was to be established at Philadelphia, while the balance, $4,300,000, was to be divided among the eight branches that were to be established in the principal cities of the Union. The entire capital was immediately subscribed, and applications were made for 4000 additional shares within two hours after the book for subscriptions was opened. The payment of the Government shares was to be in ten annual instalments, but the Secretary of the Treasury found it very difficult to comply with the requirement in respect to the entire payments, because the public demands were so pressing. The Government had not been long in operation when the necessity arose for getting a temporary loan from the bank. Congress authorized the Treasury to make loans for paying the appropriations of the year, and to pledge the duties on imports and tonnage for their repayment. This anticipation of the revenue could not be avoided if the expenditures of the Government were to be paid when they became due. The policy was condemned by Gallatin and others, but there seemed to be no other way of getting the money needed. It was a well-known practice with older governments.

These loans which were obtained from time to time were of three kinds: (*a*) They were in anticipation of the taxes for current expenditures. The last of these was made in 1795. (*b*) The sinking fund commissioners were authorized to borrow money, not exceeding $1,000,000 annually, in anticipation of the revenues, to pay interest. Each loan of this kind was to be reimbursed within a year from the time of making it. (*c*) Loans were also founded on the revenues, but the money received was applied for a specific rather than a general purpose. The first loan of this kind was to cover the expense of an Indian war.

Other loans were made subsequently. One was to raise money to ransom American prisoners that had been taken by Algerine corsairs. A more spirited method of getting them would have been a war against Algeria, but at that time it was necessary to sacrifice pride to economy. Loans of various kinds multiplied, until at the end of 1795 they exceeded $6,000,000. Hamilton and his successor in the Treasury, Wolcott, had urged the increase of taxation as the true remedy for preventing an accumulation of indebtedness, but Congress was very slow in applying it. The bank became impatient. The loan of so large a portion of its funds to the Government crippled its operations. The expedient proposed by Wolcott was to commute the debt into a funded domestic stock, bearing 6 per cent. interest and irredeemable for such a period as would invite purchasers at par. A bill was enacted with this end in view, but in consequence of delaying taxation the credit of the Government was weakened and the stock could not be sold at par. The directors of the bank saw that it would furnish no relief, and they wrote to the Secretary of the Treasury, setting forth the inefficiency of the action of Congress. The plan of relief was then modified: one-half of the stock was to be sold for less than par, if necessary, and as a final resource the bank-stock belonging to the Government could be sold. The new stock failed to attract purchasers, and after several months had passed only $80,000 had been subscribed. Then a portion of the bank-stock was sold. Of the 5000 shares owned by the Government, 2160 were sold at 25 per cent. advance. Hamilton condemned this expedient in the strongest terms. After that period the Government made more strenuous efforts to reduce its indebtedness to the bank, but several years elapsed before it was finally discharged.

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[1] Lewis's *History of the Bank of North America.*

Opposition to the bank continued from the beginning to the end of its existence. When Jefferson came into office he wrote to Gallatin, who was serving as Secretary of the Treasury, that he should make a judicious distribution of his favors among all the banks, since the stock of the United States Bank was held largely by foreigners, and, "were the Bank of the United States to swallow up the others, and monopolize the whole banking business of the United States—which the demands we furnish them with tend shortly to favor—we might, on a misunderstanding with a foreign power, be immensely embarrassed by any disaffection in that bank." But Gallatin did not share the feelings of his chief. When the territory of Louisiana was purchased in 1805, Gallatin was desirous of establishing a branch bank at New Orleans. He considered the step of the highest importance, but the President vehemently opposed such an extension of the bank. He wrote to Gallatin, "This institution is one of the most deadly hostility existing against the principles and form of our Constitution. What an obstruction could not this Bank of the United States, with all its branch banks, be in time of war!" These arguments fell lightly on Gallatin, Jefferson yielded, and the branch was authorized.

While the bank existed, the funds of the Government were deposited with it to the credit of the United States treasurer. They were considered in the Treasury from the time of depositing them, and were subject to the treasurer's control. In 1802 the balance of bank-stock owned by the Government was sold at 45 per cent. advance. The Government then ceased to be a stockholder. During Gallatin's administration of the finances only once did he apply for a loan. The revenues of the Government had grown more ample, its wants were not so pressing, and loans were unnecessary. But the advantages derived by the Government from the bank were neither few nor unimportant. These were well stated by Gallatin himself in a communication touching the renewal of the charter. The first advantage was with respect to keeping the public money; another concerned its transmission; a third related to the collection of the revenue. The punctuality of payments introduced by the banking system, and the facilities which it afforded importers indebted for revenue bonds, had enabled the Government to collect with greater facility and fewer losses the revenues derived from imposts than it would have done had no such bank existed. Lastly, valuable aid was furnished in the way of loans. From the beginning a disposition to render such aid had been manifested whenever it was desired. It was complained that the branch in New York was more inclined to grant loans to the members of one political party than to the other; whether this charge contained any truth or not, no complaint was heard after the creation of the Manhattan Company in 1799.

In 1808 the bank petitioned for a renewal of its charter, which would expire three years later. War loomed up in the distance, and Gallatin strongly favored its renewal. But it was well known that strong opposition would be made. The matter floated on the tide of uncertainty until 1810, when a decision could no longer be delayed. The necessity of the bank was more clearly seen than ever. The debate in both branches of Congress was long, able, and bitter. The old question of its constitutionality was discussed at great length, and its opponents denied that the institution was at all necessary to aid the Government in discharging its functions, insisting that there was a redundancy of capital, which was evident from the rapid multiplying of State banks. In reply to the assertion that the quantity of specie would be reduced by the exportation of the large amount of its capital belonging to foreigners, it was declared that "nothing could be more absurd." The bill for renewal was defeated by one majority in the House; in the Senate the vote was 17 to 17, and the Vice-President, George Clinton, voted against renewal; so the bank was doomed to expire within the time limited in its charter. In a short time all the evils predicted by those who contended for keeping the institution alive were experienced. Specie in great quantities left the country. Adams, the biographer of Gallatin, says that "even the most prejudiced and meanest intelligence could now understand why the destruction of the United States Bank threatened to decide the fate of the war and of the Union itself." Gallatin himself believed that if it had been suffered to live the suspension of specie payments would have been prevented, and that the terrible disorganization of the whole system of exchanges, which nearly brought the Government to a dead stop, would not have happened.

State Banks until 1816.—At the time of establishing the first United States Bank three State banks existed: the Massachusetts Bank, which was founded in 1784; the Bank of New York, created the same year; and the Bank of North America. Gold and silver constituted the standard of value, and the bills issued were redeemable in specie. "The original plan [of the Massachusetts Bank] allowed $3 of currency for $1 of metallic deposit." The bank restrictions in those early days did not permit the lending of more than "$3000 to any individual at one time, and but $5000 in the aggregate to any one borrower"; and the loan was only granted for sixty days upon merchandise, bullion, or other securities as collateral, and for thirty days only on personal obligations with two securities, "without the privilege of renewal on any terms." The merchants having gradually adopted the practice of selling their goods on credit, and requiring Spanish milled dollars for shipment to India and China, or doubloons for the purchase of the produce of Cuba for Europe, had thus become dependent on the banks for facilities, and so these institutions multiplied as trade expanded.

The banks obtained specie from various sources, but while war existed between Spain and Great Britain the citizens of our country were the carriers and commercial agents of Spain, and as nearly all the metallic treasures of Mexico passed through this channel, the banks of this country received a very substantial benefit. From the Peace of Amiens in 1801 the influx of silver abated, yet remained considerable. It was received by us in payment for European goods, and was transmitted to the sellers of such commodities, yet the specie was temporarily deposited with the banks. Says Gouge, "The specie constantly *in transitu* from South America through the United States to other parts of the world was so great in amount that a retention of the quarterly or semi-quarterly supply for only a month or two was sufficient to relieve the banks from the difficulties into which they were occasionally brought by extending their operations too far."

Banking was, on the whole, a very profitable business in those days. From 1792 to 1808 the Bank of Pennsylvania never divided less than 8 per cent., and sometimes 2 per cent. more. In 1792 the Bank of North America divided 15 per cent., the next year 13½, and for the five succeeding years 12 per cent. annually. Banking was then essentially a monopoly, and as our commerce was exposed to frequent interruptions by belligerents, the necessity for borrowing was sometimes very great, and money was not infrequently lent by banks for 2 or 3 per cent. a month. The periodical demand for the China and East India trade always caused a pressure in the money market. The business of banking was then more closely veiled than now, and the true condition of banks from time to time was known only to those engaged in their management.

It was a long time before the people generally became accustomed to these institutions and acknowledged their utility. Except a branch of the United States Bank which was set up in Norfolk in 1799, no bank existed in Virginia until 1804. Yet a subsequent writer in the *Richmond Enquirer* declares that until this branch appeared there no people enjoyed more happiness. "The desk of every agriculturist in Virginia had some gold or silver to spare if he was a prudent, industrious man, or, if he had something like money to spare, in the hands of his merchant, who, in the days of which I am speaking, acted as a banker to his prospering customers. Nor was any interest paid upon such moneys as might be deposited in the hands of the merchant, because both planter and merchant considered themselves accommodated by the arrangement—the planter in having his money safely kept for him until he wanted to use it, and the merchant in having the use of the money until it was called for." As for the need of banks in order to transmit funds from one place to another, he adds, "Nor was there the least inconvenience in transmitting money from one point to another through the merchants, whose credit then was as good as the credit of the banks now, if not better. Banks," he continues, "have destroyed the credit and confidence which men had in one another."

The banks in the larger cities, having comparatively large capitals, were conducted on principles which afforded greater safety to the public than the smaller institutions situated elsewhere, whose capital often to a considerable extent was fictitious, consisting partly in notes secured by stock, and managed by persons "with whose skill, caution, or integrity the public were very little acquainted." Yet these latter were the banks which had the most extensive circulation. In 1809 the three banks in Boston made the following return:

	Capital.	Circulation.	Specie.
Massachusetts, ...	$ 800,000	$139,850	$105,670
Union, ...	1,200,000	279,431	132,242
Boston, ...	1,800,000	226,940	161,270
	$3,800,000	$646,221	$399,182

At the same time, five other banks in the State of Massachusetts made the following return:

	Capital.	Circulation.	Specie.
Lincoln and Kennebec, . . .	$200,000	$242,847	$20,920
Northampton, ...	75,000	122,363	19,377
Hallowell and Augusta, . .	200,000	166,123	23,664
Penobscot, ...	150,000	183,470	19,586
Berkshire, ...	75,000	83,060	7,682
	$700,000	$797,863	$91,229

These figures illustrate in the most forcible manner the difference between the cautious and safe mode of conducting the banking business in the cities, and the wild and irresponsible mode of operation outside them. The consequence was that, among these country banks, failures happened not infrequently of a very disastrous character.

The first heavy bank explosion after the adoption of the Federal Constitution occurred in 1809. The notes of many banks outside Boston were at a varying discount, running as high as 5 per cent., and the merchants and other dealers in that city, on whom the burden of depreciation fell, concluded that they must do something. They raised a fund for the purpose of sending home the outside bills received in business and procuring their redemption, and of bringing suits against banks which should refuse payment. This step caused a crisis. First, the Farmer's Exchange Bank—which was a large institution, and whose operations are among the most notable in the banking history of the country—suddenly failed, and "the shock upon the public was tremendous." The Berkshire Bank followed next. The discovery that banks could fail affected the credit of all, and in 1809 most of the country banks in Massachusetts, Maine, and New Hampshire, having many bills in circulation, stopped payment. In most cases they never recovered. "It would probably be a moderate estimate to put the losses by the bank-failures of that period at $1,000,000."

When the charter of the first United States Bank expired, its notes were withdrawn, and the notes of State banks were put into the chasm. During 1811 and the two succeeding years 120 banks went into operation. Gov. Snyder of Pennsylvania had the courage to veto a bill authorizing a wholesale creation of banks in that State. They were scattered everywhere, and added nearly $30,000,000 of banking capital to the amount previously existing. Yet there was no addition of real capital. This will be seen when we describe their mode of raising capital. The first instalment was paid, and then the banks were organized and discounted stock-notes to meet the subsequent payments. The practice being soon discovered, the entire body of circulating medium except the issues of the New England banks began to depreciate. So far below par did their value fall that confidence was unsettled in their future convertibility. This increase of bank-circulation occurred on the eve of war, during the earlier period of which exports were almost annihilated, as well as the foreign and coasting trade. As only a small portion of this manufactured capital could be lent to mercantile enterprises, considerable sums were invested in Government loans. Finding a good demand in this quarter, bank-notes rapidly multiplied. The Eastern banks, however, did not subscribe so freely, because the war in that section was unpopular. The indiscretion of the banks, chiefly in Baltimore, Philadelphia, and New York, in thus expanding their issues was inexcusable. They knew that their specie was leaving them and going to Great Britain. The New England banks were liable to a penalty of 24 per cent. annually for the non-payment of their notes. This regulation produced a good effect, for their full value was maintained even when the notes of other sections were depreciated.

The banks in the Southern and Middle States having been emptied of their specie, the capture of the city of Washington in August, 1814, caused them to fail. Those at the capital fell into the hands of the enemy, but there was very little for the enemy to get. Those at Baltimore soon gave way. The six at Philadelphia fell next, whereupon their several presidents advertised with secret gladness that coin could be no longer paid. The following day the New York banks suspended, but those in New England withstood the pressure. One of them, which had speculated too largely in the paper of the Government, it was feared would succumb, but, relieved by others, its credit was saved. The Bank of Nashville maintained its ground until Aug., 1815, "the sturdy honesty of whose directors, amid such general knavery, is not less praiseworthy than it is remarkable." The broken banks, though refusing to redeem their notes, professed their desire and ability to do so at an early day. At first, the commercial world was not seriously shaken, for the legal money, gold and silver, remained the standard of value. That standard the banks could not change. Bills of doubtful credit were compared with it, and their value was ascertained. They became a merchantable commodity, and were often purchased with legal coin; they were daily sold at a discount which was regularly announced in the newspapers; they were even sold at public auction, the purchasers paying in legal money.

The people and the Government suffered considerably from the employment of this depreciated paper, but so long as the true standard was preserved creditors received their dues and business calculations and plans could be made with safety. But, unfortunately, after a time the Secretary of the Treasury believed that depreciated bills should be received without discount, not in payment of loans only, but also in payment of duties and other taxes. In Ingersoll's vigorous rhetoric, the Government hoisted the sign on its custom-houses and in the offices of its tax-gatherers, "Bills of broken banks received here." Is it singular that bank-notes then multiplied? The crier was sent into the cities to shout at the corners of the streets and in the ears of the money-changers, "depreciated money borrowed by the Government at par value." Thenceforth a premium was set on depreciation, and cities seeking their interest vied with each other in debasing their local currency. The Government was staggering along with great difficulty, but after the adoption of this policy its difficulties were vastly increased. These will be more properly described under another topic.

When A. J. Dallas was placed at the head of the Treasury department, in 1814, to get the nation out of its sad plight he recommended the establishment of another United States Bank. The State banks, as might be imagined, were opposed to its creation. He also proposed that steps should be taken for their resuming specie payments. They were willing to do this, only they did not wish to move in that direction very soon. The fact was, after the suspension of specie payments, while they were in a bankrupt condition, the banks made larger dividends than ever, as all responsibility for their issues had ceased. No wonder that they preferred to remain in a bankrupt state.

The Second United States Bank.—The State banks were not alone in opposing a charter for the second United States Bank; the speculators in exchange, whose influence was very powerful, were opposed to it. The amount of exchanges then effected annually was computed at $60,000,000. The dealers in exchange were reaping a rich harvest from the depreciated money in circulation; it was not surprising, therefore, to find them opposing an institution which, if successful, would relieve the community of the enormous tax paid to them and utterly destroy their business. Notwithstanding the opposition to the measure, a charter was granted in Jan., 1815, but Pres. Madison vetoed it, not for lack of constitutionality—a point which he regarded as settled by the courts—but for other reasons. Though the first charter failed, another was passed the next session, which the President signed without hesitation. In the mean time, Dallas sought to induce the State banks to resume specie payments, but without success. In New England the desire of the banks to return to them was very strong; indeed, they professed to pay gold and silver. In truth, they issued only a few notes, and the wants of the people were largely supplied with Treasury notes.

The bank was to exist 20 years; the capital was fixed at $35,000,000, one-fifth of which was to be furnished by the Government. Its subscription was payable in coin or in its own 5-per-cent. stocks. Other subscriptions were payable one-fourth in coin and the remainder in coin or public stocks. Five of its twenty-five directors were to be appointed by the President. The bank was to keep the Government deposits and to aid in negotiating its loans without charge. Branches were to be established, and its notes were to be receivable in all payments to the United States. In consideration of the grant, the bank was to pay a bonus to the Government of $1,500,000 in three instalments.

The object of establishing the bank was mainly threefold. First, it was expected the bank would restore specie payments, which had been suspended. Secondly, as the paper money then in circulation was not redeemable in specie, and passed at varying rates of discount, subjecting the Government and individuals to varying losses, it was expected the bank would remove this difficulty. Thirdly, the bank would provide the country with a monetary medium possessing equal value everywhere, which was not the case with the bank-notes then in use.

The task confronting the bank was stupendous. Bank-notes at Washington and Baltimore were 22 per cent. below par; at Philadelphia, from 17 to 18 per-cent.; and at New York and Charleston they were from 7 to 10 per cent. In the interior the depreciation was much greater. As soon as the bank opened, the Secretary of the Treasury directed importers to lodge their bonds with it. The bank agreed to make the discounts necessary to pay them, or rather the notes given for the duties, to secure which the bonds were taken. Congress resolved (April 30, 1816) that all duties, taxes, and debts payable to the United States after the 20th day of February, 1817, should be paid in the "legal currency" of the Government, or Treasury notes. or those of the Bank of the United States or of other banks which were paid on demand "in the legal currency of the United States." The banks also agreed to resume specie payments in July, 1817, but neither Crawford, who was Secretary of the Treasury, nor the United States Bank, had much faith that they would fulfil their agreement. Both the Government and the bank were desirous of hastening the return of specie payments, and the latter began negotiations to that end. One consideration moving the bank to do so was that, if it succeeded, the obligation which it had incurred of discounting all the bonds of importers would be very much diminished, for if the State banks paid in specie their notes would be readily taken by the Government; on the other hand, if they refused to make an arrangement, a large amount of valuable paper for discount purposes would go immediately to the national bank; thus they would lose many of their best customers.

As a result of this community of interests, a plan was devised for resuming Feb. 20, 1817. On that day the balances in the several banks belonging to the Government (for ever since the closing of the first national bank the deposits of the Government had been kept with the State banks) were to be transferred to the Bank of the United States, and retained by it until the 1st of July, when they were to be paid, with the interest thereon. In liquidating the balances which might be due, the United States Bank agreed to credit the banks respectively with the amount of their checks on banks which were parties to the agreement. The payment of the balances which might accumulate against the banks subsequently to the transfer of the balances previously mentioned from the payment to them of Government dues in return for money previously borrowed, was not to be demanded by the Bank of the United States until it and its branches had discounted for individuals other than those having duties to pay subsequently to the 19th of February, certain specified sums in various places, provided the money was wanted within sixty days by persons who should offer good security. If the whole amount should not be desired by lenders, then the balance was to be lent to the banks signing the agreement. Such is the outline of the plan for restoring specie payments adopted on that occasion.

When the bank began business, eighteen branches were established in the different States. But the notes of the national bank were everywhere received in payment of duties and other taxes to the Government, without reference to the place of issue, and were redeemable in specie at the bank or any of its offices. In those places where the medium of exchange was composed of inconvertible paper it was evidently the true policy of the national bank to contract such circulation, either by demanding payment of it in coin or by refusing to receive it. Unhappily, it pursued another policy, from which no little inconvenience was experienced.

The plan adopted for restoring specie payments was successful. They were maintained, too, while the bank existed. But to do this the national bank was required to make heavy sacrifices. Specie was imported on several occasions at heavy cost. A writer who was strongly opposed to the United States banks, and who contended that "the people were at work accumulating the means necessary to meet their engagements," and that "the currency would have soon become sound and uniform" in 1791 and 1817, admitted "that the establishment of the banks may have accelerated the resumption of specie payments in both cases." And this was the very least that could be said by an opponent concerning the great work of the bank in resuming specie payments. In order to maintain them it was necessary for the bank, in 1819, to contract its discounts and to demand specie from other banks—a movement which led them to reduce their discounts; and this change of policy, which could not be avoided, caused sore distress throughout the country. During the years 1815-16 the bank circulation increased to $110,000,000, while in the year 1819 it was reduced $65,000,000—a reduction of 59 per cent. This was truly an enormous contraction, and the evils flowing from it were undisputed.

Another very important function performed by the bank was in equalizing the rates of domestic exchange. Of course its success in this regard was not pleasing to the dealers in exchange, who were thereby deprived of their business. The circulating medium which it furnished to the country was, says McDuffie, actually more uniform than specie. Funds could be transported from one part of the Union to another through the aid afforded by the bank at an expense not exceeding one-half, and frequently less than one-quarter, of the cost of carrying silver. "Upon the whole," says a committee of Congress who investigated the condition of the bank in 1830, "it may be confidently asserted that no country in the world has a circulating medium of greater uniformity than the United States, and that no country of anything like the same geographical extent has a currency at all comparable to that of the United States on the score of uniformity."

When Jackson became President, his hostility to the bank soon appeared. He desired the removal of the deposits on the ground that they were not safe. The Secretary of the Treasury, Ingham, thought otherwise, and was unwilling to remove them. His successor, McLane, entertained a similar opinion. The President promised Duane that if he would accept the office left vacant by McLane's resignation, he should not be asked to remove them against his own judgment, but hardly had he begun his duties when the President introduced the subject. Duane soon made known his unwillingness to remove the deposits, and the President was utterly unable to bring any reasons cogent enough to change the secretary's mind. Congress had investigated the matter, had declared they were perfectly safe, and the opinion of that body and the sentiment of the country generally were strongly in favor of suffering the deposits to remain with the bank. But President Jackson's will was never subdued or thwarted by contrary opinions. He insisted on Duane's removing them. Duane refused. The President then asked him to resign. He declined. Then the President removed him, and put his attorney-general, Taney, into the Treasury office. Taney obeyed the wishes of his chief. The deposits were transferred to other banks. Congress pronounced its judgment on the proceeding, condemning it in the strongest manner. The judgment thus expressed was shared very generally by the country.

The charter of the bank was to run twenty years, and would expire in 1836. It was well known that the President was opposed to its renewal. Although it was confidently believed that both branches of Congress were in favor of renewing it, a two-thirds' vote would be required to pass it over the President's veto, and it was not expected that this number would be in favor of so doing. The fears of the bank were realized in due time; the bill for renewal passed both branches, but was killed by a veto. So the bank ceased to be a national institution at the end of the time limited in its charter; but it was re-incorporated as a State institution, and its history thereafter is to be traced in that of State banking institutions.

State Banks from 1816 *to* 1863.—When the second United States Bank was created, the various State banks continued to do business as before. The Government no longer kept its deposits with them; but it did not interfere in their affairs. Of course, the national bank, with its vast resources, overshadowed them; still, they flourished and multiplied somewhat in number. The first noteworthy change in the system of State banking occurred in New England in 1824. In February of that year an attempt was made to induce the banks of Boston to give the bills of country banks the same credit as the banks in the city gave to each other's notes. If they were thus taken, it would be necessary to send them home to be redeemed, unless the country banks should choose to make an arrangement for their redemption in Boston. It was finally agreed among the banks, though not all of them, that each should receive at par in all payments from its customers the bills of all the banks in good credit in the New England States, thus making country money equal in value to Boston money, and saving to their customers the tax previously levied in the way of a premium for Boston money. The bills thus received were not to be kept for a long time, nor to be paid out to supply the circulation of the city. Nor was it necessary for each bank to employ messengers to carry the bills home, for an agreement was made that the Suffolk Bank should do this business or procure their redemption in such manner as it saw fit. The country bills received by the other banks in Boston which were parties to the arrangement were paid over daily to the Suffolk Bank, and received in lieu thereof at par, Boston money. The bills thus received by the Suffolk Bank absorbed a considerable amount of its capital. To indemnify it for exchanging or redeeming the bills of the country banks, the allied banks each lent to the Suffolk Bank, without interest, a sum of money which was considered equivalent to the service performed. This plan of redemption was known as the Suffolk Bank system, and was of vast benefit to the public in facilitating the transaction of business and in protecting a portion of the community from a constant tax and almost every one from occasional heavy losses. The general tendency of the arrangement was to give to each bank the benefit of the principal circulation of its own neighborhood, and to direct its bills homeward when they had wandered away. The excellence of the system is shown by the fact that it continued for so many years, and became so widely accepted throughout New England. It operated as a check to excessive issues, for this could not be done without the Suffolk Bank's soon finding it out and demanding enhanced security as a condition of redeeming the bills of any bank which was inclined to engage in such business.

The next banking experiment to be mentioned was the Safety-Fund system adopted in New York in 1829. This required from each bank an annual contribution of one-half per cent. of its capital to a common fund to be deposited with the State treasurer as a "bank fund" until it amounted to 3 per cent. of the capital of each bank. This fund was to be applied to the payment of the debts of any insolvent bank contributing to the same; and in case the fund was at any time diminished by payments from it, the banks were again required to make their annual contributions till each had in deposit the 3 per cent. on its capital stock. For several years the system was favorably regarded, but suddenly ten banks failed with a capital of $2,800,000, causing a loss of more than $2,500,000, besides the entire annihilation of their capital. The result was so unexpected and so serious that the system in that State was abandoned not very long afterward. Had the fund which was raised been appropriated solely to pay bank-note holders, it would have been amply sufficient, for at the time of the bank-failures mentioned the amount of the fund was $1,876,000. The comptroller of the State very well said in one of his reports that "banks which enjoy the exclusive privilege of furnishing a currency should be required to contribute something to a common fund to make that currency safe and secure, sums reasonable and proper; but what propriety or justice can there be in requiring the banks to contribute to a general fund to pay to depositors or other general creditors of the individual banks? It is no exclusive privilege of a bank to receive deposits or to contract general debts, and no reason, therefore, is seen why this fund should be applied to pay them." This criticism led to a modification of the system in harmony with the comptroller's views.

In 1845 the State of Ohio adopted the Safety-Fund system when it established the State bank. This was after New York had abandoned it. The bank had a capital exceeding $4,000,000. It had several branches, supervised by a board of control, which furnished to them all the notes required for circulation. The quantity was limited to double the amount of the capital on the first $100,000; 150 per cent. on the second $100,000, and 125 per cent. on the third $100,000, or part thereof. Each branch had more than $200,000, and therefore was entitled to the full benefit of the above provisions. Each branch was required to deliver to the board of control 10 per cent. of the amount required for circulation, either in stocks of the State or of the United States, or in money, which was to be applied in redeeming the notes of any branch that might fail to redeem them. The system was regarded with great favor in Ohio for many years, yet it was very defective. It created a fund sufficient to give credit to any banking association which might be established for speculative purposes, yet after its notes were fairly in circulation, its capital might be withdrawn, the bank declared insolvent, and the community defrauded. Besides, while the safety fund might be nominally large enough to cover the amount of insolvent bank-notes, it was usually made up of bonds and mortgages which were not immediately convertible, and the delay in redeeming the circulation caused an immediate depreciation and occasioned a loss to those who could not wait for the ultimate redemption of their notes. Experience proved that the safety funds thus created in the several States where the system was tried, New York, Indiana, Ohio, Illinois, Arkansas, Michigan, and Alabama, realized only from 50 to 73 per cent. of their nominal value.

The Safety Fund system having proved a failure in New York, the next system was that of free banking, authorized by the legislature in 1838. As the present national bank system is founded on this, modified and improved by later experience, its origin is worth tracing. It originated with the Rev. John McVickar, D.D., professor of political economy in Columbia College, and is clearly set forth in a letter addressed "to a gentleman in Albany," and published in 1827. The pamphlet is entitled *Hints on Banking*. Very likely the author had seen a couple of pamphlets written about the close of the war of 1812 in which a somewhat similar plan was vaguely shadowed forth. Dr. McVickar, it will be remembered, wrote this even before the Safety Fund system was established. He ably set forth the evils attending banking at that time, and the true nature of the banking business and of credit. At the close he proposed a banking system the first three provisions of which are these: "I. Banking to be a free trade, in so far as that it may be freely entered into by individuals or associations under the provisions of a general statute. II. The amount of the banking capital of such individual or association to be freely fixed, but to be invested one-tenth at the discretion of the bank, the remaining nine-tenths in Government stock, whereof the bank is to receive the dividends, but the principal is to remain in pledge for the redemption of its promissory notes, under such securities as to place the safety of the public beyond doubt or risk, the stock being made untransferable except by the order of such court as shall be made cognizant of these subjects with a view to wind up the affairs of the bank. III. The promissory notes of such individual or association to bear upon their face the nature and amount of the stock thus pledged, together with the usual signatures, and in their amount never to exceed the amount of their pledged stock, under the penalty of the individual or firm being declared bankrupt and their affairs being wound up under a commission appointed by such court as shall have cognizance thereof; the refusal to redeem their notes being made in itself an act of bankruptcy and followed by the same results." Other provisions followed, but these need not be given.

The plan does not seem to have met with a favorable reception at Albany, but four years afterward, in 1831, the first fruit appeared in Maryland. A bill was introduced into the legislature providing for free banking, and that the license to carry it on should be obtained from the chancellor of the State. The applicant was to exhibit a list of his property, which was to be vested in trust in a person selected or approved by the chancellor. The deed of trust was to be drawn "in such terms and with such provisions as he may deem most proper for the security of the object of said trust." The chancellor having approved the deed, the applicant was to receive a certificate from the clerk of the county court of the deposit of the same for record. The next step was for the chancellor to determine the value of the property described in the instrument, and, having done so, he could authorize the applicant to issue notes not exceeding in amount more than one-fourth the value of such property. Subsequently, in 1834, at a local bank convention held in Baltimore, Charles F. Mayer of that city, who introduced the bill in question into the Maryland legislature, made an able report advocating the establishment of a bank having three-fourths of its capital permanently invested in mortgages. A copy of the Maryland bill was transmitted to a member of the New York senate in 1837, and for several years previously some New York capitalists had possession of it. In 1835 the "Real Estate Bank of Baltimore" was incorporated, with a capital of $5,000,000, one-fifth of which was to be paid in money and the remainder to consist of real estate. Thus it will be seen that the free-banking system, which has finally been brought to a high degree of perfection, was slowly formed in the beginning, and was chiefly the work of a college professor, and he a clergyman!

These were the chief banking systems tried in the United States during the period under review. There were various modifications of them, one of which was the establishment of State banks with numerous branches. These institutions were doubtless suggested by the United States Bank, which had branches located in various parts of the Union. One of them we have already mentioned—the State Bank of Ohio. Others existed in Alabama, Tennessee, and elsewhere, two of them deserve special mention—the State banks of Indiana and Illinois. The charter of the former bank provided that each branch should have $160,000, and be mutually liable for the debts of the other branches. No note under $5 could be issued, and the legislature reserved the right to restrict the amount to $10 within ten years. The capital of any branch might be increased with the assent of the legislature and directors of the State bank. The directors of the chief bank furnished the circulation, which was limited to twice the amount of the stock. One-half of the capital was owned by the State, for which bonds were issued bearing 5 per cent. interest. The other half was owned by individuals and corporations. Afterward notes for a smaller amount were authorized, and in 1837 it suspended specie payments. It attempted to resume them the next year, but failed; in 1841 it resumed permanently, effected a regular reduction of its debt, which had rapidly accumulated during the inflation of business in former years, and was very successfully managed until the expiration of its charter.

The banking history of Illinois is very instructive and interesting. The constitution which was adopted in 1818 declared that no new bank or moneyed institution should be permitted in the State except a State bank and its branches, and those then existing. The next year a bank was incorporated by the name of the State Bank of Illinois for 25 years, with a capital of $4,000,000, one-half of which was to be subscribed by individuals and the other half by the State. No attempt was made to set the bank in operation; in 1821 the charter was repealed, and another bank was chartered for 10 years, with a capital of $500,000, to be owned by the State, and managed and superintended by the legislature. "The act was an anomaly in legislation, and assumed the wild theory that paper money was a panacea for financial distress." The capital consisted simply of its bank-plates, and $300,000 were directed to be issued and lent on notes for one year, with mortgages as securities, in sums not exceeding $1000 to each individual. The notes bore 2 per cent. interest per annum, and the borrowers paid 6 per cent. to the bank on their notes, which were to be renewed on payment of 10 per cent. of the principal annually until the expiration of the bank charter, when the balance was to be paid. The notes of the bank were to be receivable in payment of taxes and for all public debts. Hardly had it begun operations before its bills fell to 75 per cent., then 50, dropping to 25 cents on a dollar, when they ceased to circulate. "At one of the branches, of which there were four, two dollars in specie were received, which were preserved as curiosities." The most deplorable consequences of a moral and financial kind resulted from this experiment.

But the State had not yet had enough of State banking. In February, 1835, it essayed another experiment. A new State bank was incorporated in 1837, having $4,500,000 capital. The State was a partner, and $2,000,000 bonds were issued by it to supply the capital. Fifty days were allowed for redeeming its bills. Its loans were made to irresponsible parties, and it was soon compelled to suspend payments. In 1843 it determined on liquidation. The State laid violent hands on its own bonds issued for stock and annulled its liability. Subsequently, the State burned $3,050,000 bonds issued to the two banks in the Capitol Square at Springfield.

The mode of furnishing specie, to comply with the law requiring banks to have a certain amount of it before issuing their notes, should be mentioned. A bank would get the amount needed, and keep it long enough for the State official to see it and certify that the law had been complied with, and then it would be taken to another bank and employed in the same manner. After going the whole round and supplying all the banks that were to be put in operation at that time, it would finally be sold, and thus disappear from the banks altogether. The banks were often organized in groups, which permitted the adoption of such a plan. The legislature would grant a considerable number of charters at the same session, and in this way the State banking system exploded. Its growth was spasmodic. The wave would pass from one State to another, and then subside. Then another wave would rise elsewhere, and the same history of rapid bank-formation would be repeated. So long as the public had faith that the notes would be paid they would be taken, but every now and then the fear of their non-payment would spread over the land, and specie payments were suspended. In other words, so long as people did not want specie, it was easy enough for the bank to maintain specie payments; but when the people *did* want it, the banks had nothing to pay out, and could not do otherwise than suspend.

The creation of the second United States Bank operated as a healthy check in many ways to the State institutions. They multiplied less rapidly and conducted their business with more prudence. But when the deposits were removed from the national bank, they were put into the State banks. Certain ones were selected, which were called the "pet banks." These institutions were directed by the Secretary of the Treasury to make liberal discounts in order to relieve the stringency caused by the new policy of curtailing discounts which the Bank of the United States was obliged to adopt. The suggestion was hardly necessary, for the desire to earn fat dividends led them to increase their discounts rapidly, and paper money became more abundant than ever. Besides, new banks were started in every direction, in the expectation that Congress and the Executive would not renew the charter of the United States Bank. On Jan. 1, 1830, the aggregate capital of the banks in the country was $145,192,268, and their deposits were $55,559,928—making a total of $200,752,196. Their loans and discounts at the same time were $200,451,214—very nearly the aggregate amount of capital and deposits. Eight years afterwards the aggregate capital of the banks was $290,772,091, and their deposits were $127,397,185—a total of $418,169,276. Their loans and discounts at the same period were $525,115,702, or more than twice the amount of loans in 1830, and exceeded the aggregate amount of capital and deposits by $156,946,426. Says Garland in 1850, "The State banks within a few years nearly doubled their original number, were greatly enlarged in their powers and nominal resources, and made to pour forth with prodigal hand their spurious issues of paper money—those pictured shadows that bewildered the brain, intoxicated the hearts of the people, and drove them into the maddest schemes of speculation and extravagance. Never did any nation in the same space of time make more rapid advances in degeneracy or approach nearer a total abandonment of that great moral law which constitutes the well-being of all civil society, and a substitution in its place of those time-serving expedients of interest and selfishness which never fail to end in fraud, oppression, and ruin."

One form of speculation was the purchase of Government lands. These were bought in enormous quantities. To check the speculation, a resolution was introduced into the Senate requiring payment to be made in gold and silver, but it was rejected. Then the Secretary embodied the idea in a circular which was afterward known as the "Specie Circular." It failed to cure the disease. The mode of operations was somewhat changed, but land-speculation continued on an enormous scale.

It was easy to foretell what would happen from such a vast expansion of banking facilities and wild, unreasoning speculation. After a brief period the people were seized with fear, and demanded specie of the banks in exchange for their notes. This movement immediately exposed their hollowness. They all went down, those having the Government deposits as well as the rest. This was in May, 1837; Van Buren's Administration was only two months old. The President was a warm admirer of Jackson, and had formally announced that he would continue his predecessor's policy in respect to the management of the deposits. But the "experiment" had suddenly culminated. The deposits of the Government were out of its possession, and could not be had, and it suddenly found itself confronted with the question of how to get money enough to pay its expenditures.

The banks recovered partially in 1838 and 1839, but not fairly until 1841. After this explosion they managed their affairs with more prudence for several years.

The free-banking system was extended into more and more of the States, and additional securities for the circulation were imposed. Nevertheless, in 1857 another general suspension occurred; the banks had overissued, and speculation ran riot. The people at last awoke to the situation, demanded payment of the bank-notes, and, of course, the banks had no specie to pay. Had their discounts been sound, ultimately they could have paid their notes; but too often loans were recklessly granted and recovery of them was hopeless. Even if in many cases the money were recovered, bank-bills were depreciated; they were sold at discount, and the losses to bill-holders every year were very large, although varying greatly in amount. The loss has been estimated at not less than 5 per cent. annually on the whole amount in circulation.

The National Bank System.—When the Civil War broke out, the banks of the North very generally rendered efficient aid in raising and lending money to sustain the imperilled Union. They were in a sounder condition than ever before, for they had recovered from the panic of 1857, and the lesson of that event had not yet been forgotten. They responded promptly to Secretary Chase's demands for money. Nevertheless, the Secretary was desirous of creating a national bank system. Ever since the expiration of the second United States Bank there had been a strong current running in favor of chartering another. In the presidential election of 1840 this idea was prominent in the public mind. A bill was passed by Congress providing for such an institution, but it was vetoed by President Tyler, who had succeeded to the Presidency through the death of Harrison. Another bill was passed free from all the objections urged against the former. But this, too, was vetoed. Congress then found out that while the President had previously to his election accepted the platform of his party in favor of the creation of a national bank, he did not believe in one after his election. The Democratic party, under whatever name, has never favored a national bank, and as that organization controlled legislation throughout nearly the entire subsequent period, it was quite impossible to charter a third national bank. But Secretary Chase, in his first annual report, made in Dec., 1861, recommended the gradual issue of national bank-notes, secured by the pledge of Government bonds, thus adopting for his model the free-banking system, which had then attained greater perfection in New York than in any other State. The advantages he claimed from the establishment of the system were, "a currency of uniform security and value, protection from losses in discounts and exchanges, increased facilities to the Government in obtaining loans, a diminution in the rate of interest and a participation by the people in the profits of circulation, an avoidance of the peril of a great money monopoly, and a distribution of the bonds of the nation to the leading monetary associations of the country, thus identifying their interests with those of the Government." A bill was prepared and printed embodying his views, and introduced into the House, but it was not reported at that session. Again, in his next annual report, the Secretary urged the adoption of the measure. One of the arguments now advanced was, that "the United States bonds would be required for banking purposes, a steady market would be established, and their negotiation greatly facilitated; a uniformity of price for the bonds would be maintained at a rate above funds of equal credit, but not available to banking associations." About fourteen months after the bill was first printed for the use of the committee of ways and means it was introduced into the Senate and referred to the finance committee, from which it was favorably reported with amendments. Ten days afterward it passed that body by a vote of 23 to 21; the vote in the House was 78 to 64. Only three Senators from the Middle States voted for the bill, and the same number from New England. In the House, too, many of the leading Representatives were opposed to it. In New England the Suffolk Bank system had secured a high degree of safety to the banks and note-holders; the free-banking system was working well in New York and in other States, and the people had suffered so much from banking experiments that they did not wish to try another. They were, indeed, anxious to aid the Government, but preferred working through their well tried and understood banking systems to embarking once more on the open sea of experiment.

The bill first passed the House on February 20, 1863. The law was thoroughly revised and re-enacted June 3, 1864: and on that occasion all the Senators from New England voted in its favor, and all except three from the Western States. Those from the Middle States were not so strongly in favor of the measure. In the House the vote was 78 to 63, receiving the support generally of the Republican members. In 1861 the number of State banks existing was 1601, having a capital of $429,000,000. More than ten thousand different kinds of notes were in circulation, issued by the thirty-four States then existing. The right to issue them had been so firmly established by law and custom that nothing less than a great war could have brought about the change. The bank circulation amounted to $202,000,000, and was distributed as follows:

New England States, ...	$45,000,000
5 Middle States, ...	53,000,000
11 Southern States, ...	74,000,000
8 Western States, ...	30,000,000

The National Bank Act authorized the issue of $300,000,000 of bank-notes, which were to be based on United States bonds. The amount was limited to 90 per cent. of the current market value of the bonds, and in no case could it exceed 90 per cent. of their par value. The payment of the notes was guaranteed by the Government, and if the avails of the bonds deposited with it to secure the notes issued were not sufficient to reimburse the Government, it had the final lien on the assets of the bank. The law provided that they should be received by the Government in payment of all taxes and other dues except duties on imports, and they were payable for all debts owing by it except interest on the public debt and the redemption of bank-notes. A national bank bureau was established in the Treasury Department, whose chief officer, styled the comptroller of the currency, has the general superintendence of these institutions.

As soon as the act passed a new demand for the Government bonds, as the Secretary of the Treasury had expected, was created. The discount of 7 per cent. at which they were then selling soon disappeared, and they commanded a premium. There was delay in printing the notes, and no issues appeared until Dec. 21, 1863. The banks formed under the act were new associations; and conversions of the State banks did not take place generally until after the act of March 3, 1865, which declared that every State bank should pay a tax of 10 per cent. on its notes issued. This enactment was declared to be constitutional, and then the conversions began. During 1865 the system was adopted by 731. Nearly all the banks in the New England States and many in other States became national associations. During the following year $298,188,419 of national bank circulation had been issued. At this time more than $1,275,000,000 of temporary obligations of the Government were outstanding. Within a comparatively short time the banks held $440,000,000 of this amount; thus, they performed a valuable service in absorbing the debt of the Government. In 1870, Congress authorized an increase of the national bank-notes to $354,000,000. The largest amount ever outstanding was on Dec. 1, 1874, when the sum was $352,394,346. The same year Congress provided for withdrawing the notes of any bank. It could deposit lawful money with the treasurer in sums not less than $9000, and withdraw a proportionate amount of bonds held as security for its notes. Under this provision during the next three years the circulation was diminished more than $30,000.000. In 1875, Congress repealed all restrictions relating to the amount of circulation, and ever since the banks have been free to increase or withdraw their circulation under the regulations prescribed.

Another requirement of the act may be mentioned. One-half of the capital stock must be paid before a bank can begin business, and the balance must be paid in five monthly instalments. No bank can be organized having less than $50,000 or in a place having less than 6000 inhabitants. In larger places the capital must be from $100,000 upward. In cities possessing 50,000 people the capital cannot be less than $200,000. The banks cannot lend money on real estate or on the security of their own capital stock or of their own circulating notes or legal-tenders, nor can they make accommodation loans to any person, company, corporation, or firm to an amount exceeding one-tenth part of their capital. Nor can they borrow money on their own circulation, or become liable to an amount exceeding their capital stock paid in, except on account of their circulating notes, their deposits, and bills of exchange drawn against money actually on deposit, and liabilities to stockholders for reserve profits. They must be governed by State laws in stipulating for interest.

The banks were authorized to do business for twenty years. The charter of the first bank that organized under the law expired Jan. 1, 1882; that of the second on May 11 of the same year. From that date until Feb. 25, 1883, the corporate existence of 393 would terminate, including 297 banks on the day last named. Early in the session beginning in Dec., 1882, efforts were made to authorize the extension of these charters. The banks had a right to organize anew, but this involved several serious changes. One was, that executors, administrators, guardians, and other trustees holding stock in that capacity could not subscribe as members of the new organization. Another necessary step, if reorganization were undertaken, was a division of the surplus which had accumulated during the more prosperous periods. To make the banks strong it was very desirable to retain this. During the long period of depression after 1873 the national banks lost a great deal of money, which was deducted from this surplus. Said a committee of Congress which reported on the subject of renewing the charters, "Had it not been for this fund of undivided earnings, very many of the banks would have been unable successfully to meet the financial disasters and losses following the panic of 1873. During the four years from 1876 to 1879, inclusive, the losses of the national banks, through the failure of debtors to pay their obligations, aggregated $85,845,069. Such, however, was the strength afforded to these institutions by the fund of undivided earnings that no serious consequences followed. The refusal or neglect to extend existing organizations would compel the division of this accumulated surplus. The new bank organizations would start simply with their paid capital, and with less ability to meet losses than the banks whose places they would take." This was a weighty reason for renewing them, the force of which was recognized. Congress extended their charters; so they are either now living, or soon will be, on the second term of their existence.

The great merits of the system over every other that has been tried are widely recognized. In the first place, the note-holders are absolutely secured. No losses from any bank-failure have ever come to them. Previously, as we have seen, they were continually losing from bank-failures and depreciation of bank-notes. Now, the note of one bank is as good as that of another, and will pass just as readily in any part of the Union. Previously, notes were scrutinized, and were not taken far away from home generally, except at a discount varying greatly at different times and places. The losses from broken banks and bank-note depreciation were enormous every year.

Another good feature of the system is that of public examination. Examinations were made under former systems, but these were for the most part a mere form. They were not thorough; they were not conducted by competent officials, and too often examiners winked at the irregular practices discovered. It is true that failures happen occasionally, but they are not so frequent and the losses are smaller. Said Mr. Knox, comptroller of the currency, in his report rendered in Dec., 1881, "The estimated loss to creditors from the failures of national banks during the 18 years since the passage of the act is $6,240,000, and the average annual loss has therefore been about $346,000 in the business of corporations having an average capital of about $450,000,000 and deposits averaging about $800,000,000. Twenty-one of these insolvent banks have paid their creditors in full, and forty of them have paid more than 75 per cent. each. The individual liabilities of shareholders of insolvent banks have been enforced in fifty-three instances, and about $2,700,000 has been collected from this source." When writing on this subject in 1881, Mr. Knox said, with reference to 15 national banks which had failed previous to 1870, that the percentage of circulating notes unredeemed was 0.75 per cent. of the amount issued. It was estimated that the ultimate loss to the people from the destruction of these notes, or from failure to present them for redemption, would be from 1 to 1½ per cent. This loss to the note-holders would not be gained by the banks, but by the Government. Regarding the foregoing estimate as correct, it would amount to from $3,500,000 to $5.000,000 during each period of 20 years. Since the resumption of specie payments the banks have issued no notes of a lower denomination than $5.

The national banks in the 18 principal cities are obliged to keep a reserve of 25 per cent. on their circulation and deposits. In the case of the New York City banks they must hold this reserve in lawful money. With respect to the banks in the other 17 cities, they must hold one-half of their reserve in this manner, but may deposit the other half with national banks in New York. With respect to the banks outside these 18 cities, they must hold a reserve of 15 per cent. on their deposits, three-fifths of which may be kept with their bank correspondents in the 18 reserve cities.

The profits of the banks are derived more and more from their deposits, especially in the larger cities. Formerly, the chief profits came from their circulation. But as the country has increased in wealth the deposits of the banks have expanded enormously. It is true that the country banks still look to their circulation as an important, and often principal, source of gain; but this is no longer the case with the banks in the great banking centres. On the other hand, they have been retiring their bonds for several years to a considerable

STATES.	Capital.	Circulation.	Loans and discounts.	Individual deposits.
Massachusetts, .	$95,852,500	$68,572,889	$195,125,394	$114,397,392
New York, . . .	87,580,567	47,596,145	335,378,784	409,934,724
Pennsylvania, .	57,152,051	40,618,976	154,445,895	148,490,486
Ohio, ...	32,604,000	20,839,922	74,442,871	60,734,873
Connecticut, . .	25,556,820	17,217,745	43,468,889	24,933,405
Rhode Island, .	20,315,050	14,143,039	30,078,658	11,460,515
Illinois.	18,989,600	9,799,530	73,117,769	69,763,033
Maryland, . . .	13,922,030	8,793,523	31,575,651	23,995,278
Indiana, ...	13,323,500	8,117,470	27,585,401	24,942,872
New Jersey, . .	12,375,350	9,769,701	31,481,551	28,606,952
Kentucky, . . .	11,421,350	9,198,631	19,583,643	11,506,117
Michigan, . . .	10,855,000	5,793,152	29,825,149	26,238,875
Maine, ...	10,335,000	8,090,233	18,237,910	10,433,752
Vermont, . . .	7,786,000	6,487,367	12,186,775	5,965,461
Iowa, ...	7,135,000	4,683,116	17,799,344	16,169,065
New Hampshire,	6,080,000	5,147,345	8,137,442	4,569,085
Minnesota, . . .	5,920,000	1,986,694	17,907,894	14,045,218
Missouri, . . .	4,980,000	1,881,290	12,890,836	9,608,139
Tennessee, . . .	3,715,300	2,780,500	8,434,524	7,590,120
Virginia,. . . .	3,263,060	2,617,100	10,444,317	10,293,487

extent, and have withdrawn their circulation, as we have seen. The above table, extracted from the report of the comptroller of the currency, exhibits, in the order of their capital, the twenty States having an amount of capital in excess of $3,000,000, together with the amount of circulation, loans and discounts, and individual deposits of each, on Oct. 3, 1882.

Although the national-bank system has overshadowed the State banks, yet many of the latter still exist, being regulated mainly by the free-banking law. But, as they have no circulation, the national tax of 10 per cent. driving it out of existence, one cardinal feature of the free-banking system has fallen into disuse. In 1880–81 there were 683 State banks, possessing a capital of $112,111,325 and $373,032,632 deposits. They continue a prominent feature, therefore, in the banking world in receiving deposits and lending capital. There are many private bankers also who receive deposits and lend them to others. (See also LAND BANKS, PEOPLES' BANKS, and SAVINGS BANKS.) (A. S. B.)

BANKRUPTCY. The power which the Constitution of the United States gives to Congress to pass a general bankrupt law has been but sparingly exercised. The laws of 1800 and 1840 were in operation, one for two years, and the other for thirteen months. They had been passed at the urgency of the debtors of the country, who had suffered in the commercial crises preceding these dates, and were repealed when they had done their work. In 1867 there was a similar pressure, but the commerce and various industries of the country had greatly increased, so that the importance of a permanent law of this sort began to be seriously felt; and Mr. T. A. Jenckes of Rhode Island, the author of the law which was passed in that year, took great pains to adapt it to the needs of both creditors and debtors—to the former, by providing against preferences to favored creditors and by dissolving all recent attachments upon the bankrupt's property; and to the latter, by giving a discharge to honest debtors on conditions which were not onerous.

See Vol. III. p. 294 Am. ed. (p. 341 Edin. ed.).

In 1874, under the stress of hard times, Congress made changes in the law which rendered it very difficult and expensive for creditors to compel an adjudication of bankruptcy, and, at the same time, it copied from a then recent English law a mode of discharge by composition, which has proved, in both countries, to be highly objectionable in practice by giving too much power to the debtor and too little supervision to the courts. These changes having displeased the creditors of the country, and debtors having been very generally discharged, the law was repealed in 1878. It would have been better to amend it, somewhat as the English law is likely to be amended, by providing more full and careful control by the courts or their officers over the proceedings. Since its repeal many of those most concerned, such as the mercantile associations of the country, have exerted themselves to procure another law to be passed by Congress, but as yet without success.

The States can do something in the way of bankruptcy legislation, but not all that is needed. A discharge granted by the authority of a State can release the debtor only from the debts which he owes to residents of the State and to those who choose to come in and prove their claims. This leads to hardships for poor debtors, and to corrupt compromises with foreign creditors by those who have some means and few scruples. A discharge under an act of Congress operates throughout the Union. It is this defect of power in the separate States which has led to the enactment of the general bankrupt laws hitherto.

With the growth and wide extension of commerce, the other great feature of a bankrupt law, equality among creditors, has become of great interest and importance, and has led to all the recent legislation upon the subject. Nearly all persons interested agree in praising this equality, but State legislation will not effectually enforce it. The practice has become deeply rooted in our jurisprudence that a domestic creditor attaching the goods of his debtor is to be preferred to a trustee under a foreign bankruptcy, and "foreign" means any place outside the State. This preference is given, though the State where the bankruptcy occurs and the State where the creditor seizes may have bankrupt systems precisely alike. It is not, therefore, a question between the law of one State and that of another, but a privilege given by both States, as occasion arises, to its own citizens because they are its own. Here, again, the operation of a law of Congress is uniform throughout the country.

Apart from this peculiarity, the laws of nearly all the States recognize the virtue of equality by providing that when an insolvent debtor makes a general assignment for the benefit of his creditors he shall treat them all alike. A few States and Territories which have not yet made this provision will be mentioned presently. This legislation, though not new, has been greatly extended since the useful operation of the late bankrupt law brought it to the attention of the country.

These laws, though useful, are inadequate to enforce equality in many of the most important cases, because it remains optional with the debtor whether he shall make a general assignment. If he does not, but conveys away all his property to a few favored creditors, one by one, these laws are evaded, but without remedy. See *Burrill on Assignments* (ed. 1882, page 215).

A summary of the laws of the States may be interesting, but it must be borne in mind that they are constantly changing, and what is an accurate statement to-day will not be quite so to-morrow. In a general way the tendency is towards equality; and it may be safely predicted that if Congress does not pass a general law, the States will one after another amend these statutes to give more and more effect to the demand for equal rights to creditors.

The old insolvent laws which relieved an imprisoned debtor from confinement upon his surrendering his property, either to the particular creditor or for all his creditors, are nearly obsolete, because imprisonment for debt has been abolished, though they still remain upon the statute-books.

No bankruptcy system is complete unless it has compulsory clauses for the use of creditors against debtors who do not intend to give up their property or who intend to divide it unequally. The States which have such complete systems are Maine, Vermont, Massachusetts, Connecticut, Rhode Island, Maryland, Louisiana, and California. In Georgia creditors have power by bill in equity to compel something very like bankruptcy against an insolvent debtor. A statute of Minnesota punishes preferences as crimes in certain cases.

It will be observed that a large proportion of the States which have complete systems of bankruptcy are in New England. The reason is that in New England all actions may be begun by attachment without notice and without leave of court, so that the earliest creditors almost always obtain an advantage. This makes the merchants of the cities slow to sell in those States, and almost compels a resort to some process which will render attachments useless, as all these laws do, unless the attachments have been levied so long before the bankruptcy as to have created a sort of vested right. All the New England States except New Hampshire have found it wise to pass these laws; and it is probable that New Hampshire will follow in the same path.

In the other States the necessity is not so pressing and universally felt, but it is becoming more important to them as their industries increase in number and variety. With an agricultural community such laws are of little use. All the States and Territories have provided for equality in general assignments excepting New York, Maryland, Virginia, West Virginia, the Carolinas, Indiana, Wisconsin, Arkansas, New Mexico, Idaho, Arizona, and the District of Columbia. Nearly all these States and Territories are at present devoted to agriculture or mining, and some Territories have hardly had time to find out what they do require.

The great commercial State of New York has never passed a full bankrupt law. Some of the most distinguished lawyers of that State very many years ago advised the legislature that laws which granted a discharge of debts without full payment were demoralizing, and advised against a further extension of such laws. Among these was Chancellor Kent, who repeated the same views in his commentaries, and whose opinion has very justly had great weight. The merchants of New York, however, are generally favorable to bankrupt laws in other States, or, better still, to a general law by Congress.

New York has had since before the Revolution a voluntary bankrupt law; but it requires that two-thirds of the creditors in the United States should join with the debtor in his petition, which renders it useless in cases of fraud and difficult in many others. Insolvent estates are therefore very commonly settled by assignments, in which preferences, though discouraged, are not absolutely forbidden. Michigan has copied the insolvent law of New York. (J. L.)

BANNACKS, or **Bonacks**, an Indian tribe of the Shoshone family. When first known they dwelt in the nearly desert region south of the Snake River, and between the Blue and the Rocky Mountains. At an early date, however, they obtained horses and sought more fertile regions, finding hunting-grounds in the Yellowstone country, and ranging in and through Northern Utah, Wyoming, Southern Montana, Nevada, and Idaho. Their whole number at present is estimated at 1000 souls. They are a proud, brave, fine-looking race, variously described by different writers as dangerous and treacherous, as of unusual dash and bravery, and as cowardly, filthy, and indolent. These varied descriptions may apply to portions of the tribe in different localities and with different habits of living. They have been generally at peace with the whites, but a portion of them became hostile in 1866. In 1878 another outbreak took place, caused by insufficiency of food from inadequate Congressional appropriations for their support. Several sharp engagements took place, but the Indians were soon forced to surrender. They have been recently placed on reservations in Idaho. Their language belongs to the Shoshone family of speech, of which it is an aberrant dialect.

BANNS OF MATRIMONY, a public announcement, made in a church or other place prescribed by law, of the intentions of the persons named to enter into the state of matrimony, with notice at the same time to any one to make objection if he knows any reason why the marriage should not take place. The word "bann" (Low Latin, *bannum*) is plainly connected with *bannan*, to denounce, and shows that the object of the proclamation is to ascertain whether the marriage intended is prohibited. The practice is entirely unknown in the Greek and Oriental churches, and there is no record of it in the West before the end of the twelfth century. When Christianity was established in Europe marriage was not regarded as a religious ceremony, and centuries elapsed before that view was accepted. The Church, however, in the exercise of discipline, pronounced on the validity of marriages, and required the faithful to seek spiritual advice beforehand and its blessing afterwards. As their power increased, the ecclesiastical authorities steadily endeavored to bring the practice of the Western nations into conformity with the old Roman law. They also extended the prohibitory degrees, forbidding the marriage of first, second, or third cousins, and counting relationship by affinity the same as that by consanguinity. They even declared that godfathers and godmothers became spiritually related to the child baptized and to each other, and hence arose a new complication of relationships. Again, a marriage was declared null and void if on either side there had been a pre-contract, although nothing had ever been done to carry out the contract. In such circumstances there was constant possibility that any particular marriage might, from reasons entirely unknown to either of the parties concerned, be discovered to be void, and the precautionary measure of calling upon the people generally to make known any possible hindrance to an intended marriage, and prohibiting them from doing so afterwards, seems eminently wise.

The practice is supposed to have originated in France, and was first authoritatively enjoined in the pontificate of Innocent III. (1198–1216), who did so much to extend in various ways the power of the Church. The earliest canon on the subject is the eleventh of the Synod of Westminster, A. D. 1200, which declared that "no marriage shall be contracted without banns thrice published in the church." By the Council of Lateran, A. D. 1215, this was prescribed for the whole Latin Church. A century later the archbishop of Canterbury published a constitution directing priests, when requested to perform a marriage, to inquire of the people as to the immunity of the bride and groom, but there is abundant evidence that the parochial clergy, as well as vagrant priests, were remiss in carrying out the requirements. Customs varied in different countries, but gradually the banns came to be required by the civil as well as the ecclesiastical law. In the Teutonic nations opposition to clerical regulation of marriage continued till the Reformation, and we find Luther, the great exponent of the genius of the German people, saying, "It is not fitting that the clergy and servants of the Church should order or rule anything concerning marriage, but leave each country and town to follow its usages and devices. Some announce the marriage by calling the banns two or three weeks before; but all such matters I leave to the princes and town-councils to settle and direct as they see fit." At the Council of Trent, A. D. 1545, the law of matrimony was finally settled for the Roman Catholic Church, and by it the banns must be published in the vulgar tongue on three separate Sundays or holidays during the celebration of the mass. The bishop may, however, at his discretion allow the dispensation of one, two, or even three, proclamations. In the countries where the Reformation prevailed the usage of banns was then so well established that it was readily continued. The laws usually required that the proclamation be made in the church by the clergyman of the parish in which the parties intending marriage reside, or if they reside in different parishes proclamation must be made in both; and a proper certificate that this has been done must be shown to the clergyman called to perform the marriage. Proclamation must be made in an audible voice in the presence of the congregation assembled for divine worship.

In England, by the canon of 1604, no clergyman was allowed to unite a couple in matrimony unless the banns had been thrice published, on pain of suspension for three years. Even the Westminster Assembly of Divines in their Directory for Worship, which was adopted by both the English and Scotch Parliaments in 1645, required the publication of banns before marriage could be solemnized. Under the English Commonwealth the statute of 1653 allowed the proclamation to be made in the market-place on market-days from ten o'clock till noon, as well as in the parish church. This was a concession to the Independents and Separatists, and we find that in Boston, in Lincolnshire, in the three years from 1656 to 1658, while 314 marriages are recorded as proclaimed in the market-place, only 131 were proclaimed in the church. After the re-establishment of Episcopacy under Charles II., the non-conformists resorted to clandestine marriages, on account of their religious scruples, while others of the middle classes, and even of the higher classes, paid the license fee to avoid the expense of a wedding publicly announced. In the eighteenth century the chapel of the debtors' prison at Fleet Ditch, London, became notorious for irregular marriages. After some ineffectual attempts to suppress the growing scandal of "Fleet weddings," Lord Chancellor Hardwicke prepared an act which with some modifications was adopted in 1753. By it banns were strictly required, though the bishops still exercised the power of granting dispensations. The practice enjoined by this law generally prevailed, yet some irregularities continued; and inasmuch as Scotland was exempt from its provisions, runaway lovers and others who wished to avoid the publication of the banns, and yet be legally married, resorted to that country, where the civil law required nothing as essential to marriage but a contract in the presence of witnesses. Gretna Green, on the Scottish border, became noted for runaway matches, and the practice continued till 1856, when an act of Parliament declared such marriages void unless one of the parties at least had resided in Scotland three weeks previously.

By the present English law the banns may be dispensed with if a license or certificate is obtained from the registrar of the district. In Scotland the rule of the Westminster Assembly is still the law of the Established Church, and in the civil courts a marriage without banns is considered clandestine, yet if valid otherwise it is followed by no penalty or loss of rights. Down to the end of the seventeenth century the General Assembly frequently took action upon the subject, endeavoring to enforce discipline and prevent any evasion of the law. Afterwards both Moderatism and Secession, each in its own way, helped to effect the decay of the custom. In France the civil law requires the banns to be published at the office of the mayor of the commune.

The New England churches, generally adopting the Westminster Confession of Faith, adhered to the practice of publishing the banns, and it continued for some time in the present century. The notice was given at the close of public worship by the parish clerk. So Lowell, in his Yankee poem on "The Courtin'," tells us, "They was cried in meetin' come nex' Sunday." At a later time the names of persons intending marriage were posted near the church-door, but finally it was considered sufficient for all purposes to obtain a license from the town-clerk. In the Book of Common Prayer of the American Episcopal Church a form is given for publishing the banns, but it is also stated that as "the laws respecting matrimony are different in the several States, every minister is left to the direction of those laws." In nearly all American Protestant churches the practice has now fallen into complete desuetude. Among the strictest Reformed Presbyterians, or Covenanters, it is insisted upon as a part of church discipline, and perhaps in some other obscure sects it still finds lodgment. By statute law in most of the United States a license for an intended marriage must be obtained from the town- or county-clerk, but in none is there any law on the subject of banns. In the States of New York and Pennsylvania no previous license or publication is necessary to the validity of a marriage. (J. P. L.)

BAPTISTS, IN THE UNITED STATES. Beyond question, Roger Williams was the earliest Baptist in the New World. In 1635 he urged the principle, then peculiar to the Baptists, that no one should be bound to assist in maintaining worship against his own consent. In 1639 he was baptized by immersion in Providence, the settlement which he had made after leaving Massachusetts, and united with others in founding in that place the first Baptist church in America. The views entertained by Williams were the result of his own meditations. The fact that he conceived and announced the principle of religious liberty long before the rest of mankind were prepared to accept it entitles him to rank among truly great men.

But it would not be correct to say that all the Baptist churches of America trace their origin to him. Two years after Williams founded Providence Plantations, John Clarke, an eminent Baptist, founded the colony of Rhode Island on the island of that name. Under the constitution of this colony no one was "to be accounted a delinquent for doctrine," and the magistrate was to punish only "breaches of the law of God that lead to civil disturbance." The church in Dover, N. H., the earliest Baptist church in that colony, was founded by Hansard Knollys in 1639–40. Its members, being persecuted on account of their religious sentiments, removed in 1641 to Long Island, and subsequently to Piscataway, N. J., now more commonly known as Stelton. The church in Swansey, Mass., the oldest Baptist church in that commonwealth, was founded in 1663 by a colony of Welsh Baptists from Swansea in Wales. There were Baptists in North Carolina as early as 1653, but no evidence exists of a church organization before 1737. The ordinance of baptism was administered by immersion in Connecticut in 1674, but it was not until 1705 that the earliest Baptist church in the State was formed, at Groton. The first Baptist church of Charleston, S. C., had been formed in Maine, and was carried thence by emigration to South Carolina. Without entering fully into particular instances, it suffices to say that the origin of the Baptist churches in the several States was due to three causes. Sometimes, as in the case of Roger Williams, persons who had left England on account of their independence of character and their disquiet under a state religion were led by study of the Scriptures and by their own reflections to adopt Baptist sentiments. In other cases, persons who had been Baptists in the Old World sought in the New World a refuge from persecution and a future for their children. In other instances, these persons and their spiritual descendants carried their Baptist principles either by emigration or by evangelistic labors to the different colonies.

Growth.—It was not until 1802 that the Massachusetts Missionary Society (probably the first Baptist missionary society in America) was formed, having for its object the preaching of the gospel in the destitute parts of the country. But long before that time persons urged by a sense of individual responsibility had gone out as volunteer evangelists, preaching in remote regions. The most eminent of these laborers was Elder John Leland (1754–1841), a native of Massachusetts, who labored extensively in Virginia and elsewhere. This remarkable man in the course of his missionary tours travelled 75,000 miles and baptized more than 1500 converts.

The tenacity with which the Baptists hold to the doctrine of church independence and the absence of a compact organization have at all times made the collection of their statistics a matter of difficulty. There are not known to have been in 1770 more than 77 Baptist churches in America. Undoubtedly, the growth of the denomination during the last part of the eighteenth century was promoted by the fact that the Baptists were heartily in sympathy with the spirit of the Revolution and with all efforts for civil and religious liberty, and also by the fact that the civil disabilities under which they had labored were gradually removed. Their growth, according to the most reliable statistics, has been as follows:

Year.	Churches.	Members.	Year.	Churches.	Members.
1784.........	471	35,101	1851......	9,552	770,839
1792.........	891	65,345	1860......	12,279	1,016,134
1812.........	2,164	172,972	1870......	17,745	1,419,493
1832.........	5,320	384,926	1880......	26,060	2,296,327
1840.........	7,771	571,926			

The statistics for 1882 are as follows: Associations, 1167; churches, 26,931; ministers, 17,000; baptisms, 94.680; members, 2,394,742. Of these members, about 608,000 are in the Northern States, and about 1,785,000 in the Southern States, of whom about 715,000 are colored. It should, however, be added that in the case of 290 associations the statistics for 1882 were imperfect, being from former years, while in the case of 61 associations no figures are given.

Doctrines.—The fundamental principle of the Baptists is that the New Testament is the only rule of faith and practice, and that Christ alone is the Teacher and Lawgiver in his Church. Hence, they decline to attach any authority to tradition or to recognize as binding any human teaching. They use creeds and confessions as convenient expressions of their views of the teaching of Scripture, but regard them as human in origin and authority. In the essentials of religion the American Baptists as a body hold the same views as the orthodox Congregationalists and Presbyterians. They also hold with the utmost tenacity to regeneration as an essential condition of church-membership, to absolute freedom of religious opinion, and to a complete separation of Church from State. They have always protested against all state support of religion and the infliction of penalties and disabilities on religious grounds. These principles, in holding which they were for a long time singular, have now become largely received by American Christians of all Protestant denominations. The American Baptists also hold that baptism, according to the Scriptures, is immersion; that the only subjects of baptism recognized in the New Testament are intelligent, voluntary believers; and that no authority exists for making any change in either the act or the subjects of baptism. Believing that there is no baptism except by the immersion of an intelligent believer, they are forced logically to hold that only baptized believers are qualified to partake of the Lord's Supper.

Church Order.—Baptists hold that there is but one order in the ministry, and that it is not a priesthood, the minister having no authority save that which, according to the Scriptures, pertains to the pastoral office to which the church has called him. The deacons are members of the church, chosen as advisers of the pastor and as aids in the administration of the spiritual and temporal affairs of the church. The American Baptists adhere to the congregational form of church government: the local church is the unit, and each church is competent to perform all ecclesiastical acts, such as the calling, the ordination, the dismissal, the deposition of a minister. But this view carries its own corrective. As a church is competent to ordain a minister, so each other church is competent to receive or decline to receive the minister. It is a custom among the churches, which has attained to the authority of an unwritten law, for a church, when contemplating any important action, such as the ordination or deposition of a minister, to call a council of delegates from neighboring churches, to whose advice the church voluntarily but almost uniformly conforms. Any body of believers is competent to unite as a church; but such a body would hardly have the standing of a Baptist church until recognized by a council which should examine into its doctrinal views and its practices.

Early in the history of the Baptist churches the desire for mutual counsel and encouragement, particularly in view of the persecutions to which they were subject, led the scattered and often feeble churches to form among themselves associations, each consisting of "messengers" from the several churches. This body exists only for conference, for mutual enlightenment, and for the furtherance of devotion and of benevolent activity. Ecclesiastical authority is expressly disavowed. The Philadelphia Association is the oldest in America, having been formed in 1707 and originally embracing all the churches in America.

Missions.—In 1812, Adoniram Judson with several associates sailed from America, under the auspices of the American Board of Commissioners for Foreign Missions, as the first American foreign missionary. During the voyage to India his views as to the act and the subjects of baptism were changed, and on his arrival in India he was baptized. The Baptists of America at once assumed his support, and in 1814 they formed the General Missionary Convention of the Baptist Denomination in the United States of America for Foreign Missions. In 1845 this body took the name of the American Baptist Missionary Union. During the sixty-nine years of its existence it has sent out to heathen lands 500 missionaries, besides employing a very large number of native assistants. The contributions to its treasury have amounted to more than $7,800,000. Its missionaries have baptized about 185,000 converts. It has issued in thirty-three different languages not less than 328,416,274 pages of religious reading, in addition to 200,000,000 pages of the Bible. Its missionaries have translated the whole or parts of the Bible into 16 different languages.

The American Baptist Home Mission Society was formed in 1832, having for its object the preaching of the gospel in North America. It has sent out 910 missionaries and teachers. It has planted 2838 churches, and has received in contributions $4,200,000. With the close of the war in 1865 a new field was opened for home missions among the freedmen. The society has planted for this class 12 schools (besides 1 for the Indians), which in 1881 had 40 teachers and 2397 scholars, of whom 473 were studying for the ministry, while many were preparing to be teachers. In addition to the above, much has been done by private effort.

In 1845 the Baptists of the Southern States formed the Southern Baptist Convention, which has prosecuted both foreign and home missions. It has sent out 75 foreign missionaries, who have planted churches with, at present, 740 members. It has raised for foreign missions $1,083,683. Its home missionaries have planted 321 churches and baptized 36,712 persons.

Publication Work.—In 1824 the American Baptist Publication Society was formed for the purpose of printing and circulating religious and denominational literature. It has issued 185,553,160 copies of books, tracts, and papers, equal to 6,877,154,000 pages (18mo). It has received as contributions (not including sales) $1,635,355.

Sunday-schools.—The same society has also acted as a Sunday-school society, has employed 1945 Sunday-school missionaries and colporteurs, and has planted 5334 Sunday-schools. In 1881 there were 15,138 Baptist Sunday-schools, with 130,606 teachers and 1,065,000 scholars.

Education.—The position of the early Baptists was largely one of protest against the opinion that education without the presence of special divine grace could fit one for the office of the ministry. This position, with the poverty of the pioneer Baptists, tended to make their early movements in favor of education feeble and halting. Many of their early leaders were, however, educated in the institutions then existing. In 1764 the first incorporated institution of learning among the Baptists of America was founded at Warren, R. I., whence in 1770 it was removed to its present location in Providence. There are now under the care of the denomination 33 colleges, among which are many of deserved eminence and large resources. Vassar College, Poughkeepsie, N. Y., is the first endowed institution of the highest grade for women ever established.

The first theological institution established by Baptists was founded in Hamilton, N. Y., in 1820. There are now 8 theological institutions, of which that at Rochester, N. Y., is most largely endowed, while the institutions at Morgan Park, Ill., and at Louisville, Ky., lead in the number of students. Of academies the *Baptist Year-Book* gives the names of 53, but this is very far from a full enumeration.

Among the leading Baptist educators have been James Manning, Francis Wayland, Ezekiel G. Robinson, Barnas Sears, Martin B. Anderson, J. L. M. Curry, John A. Broadus, and John M. Gregory.

Literature.—During the seventeenth and eighteenth centuries authorship among the Baptists was chiefly confined to controversial works, designed to repel the attacks of adversaries. But as their position became more assured, and as education among them became more widely diffused, the field of authorship was widened, and the denomination has contributed its fair share to the literature of the country and the age. In the department of biblical criticism and exegesis it has furnished Hackett, Conant, Kendrick, Ripley, Clarke, Clark, and Bliss. In Bible translation (in addition to some of those just named) there have been Judson, Mason, N. Brown, and Dean. In history and biography there may be named Backus, William R. Williams, Gammell, Jeter, George W. Anderson, Francis Wayland, Sears, David Weston, Gregory, Cathcart, Burrage, and Cutting. In theology, ethics, and metaphysics there are the names of Hovey, Wayland, Dagg, Pepper, Dodge, and Pendleton. In classical literature we may name Kendrick, Lincoln, Harkness, and Champlin. In homiletics, Ripley, Broadus, and Robinson have been eminent as authors, while in the matter of sermons the list is too long for an attempt at enumeration. Among the leading hymn-writers have been S. F. Smith, Judson, Dyer, Gilmore, Washburn, Lowry, Doane, Mrs. Judson, Mrs. George W. Anderson. (H. L. W.)

BAPTISTS, CANADIAN. The earliest Baptist church in Canada of which any record is preserved was one which was formed in Bristol co., Mass., in 1763, by thirteen persons who shortly after emigrated in a body to what is now Sackville, New Brunswick. Here they remained some eight years, during which the number of members was increased to about sixty. In 1771 the original founders of the church returned to Massachusetts. Their converts were probably scattered, and subsequently became connected with other churches. A second church, composed of Baptists and Congregationalists, was formed shortly after the first, in Horton, Nova Scotia. Within the ensuing twenty-five or thirty years others were planted at Cornwallis, Chester, Argyle, Halifax, and other places in that province, and within the first fifteen years of the present century at Salisbury, St. John, Fredericton, and other points in New Brunswick. The religious movements to which many of these early churches owed their origin and progress were largely fostered by evangelists from the New England States, some of them under the patronage of the Massachusetts Baptist Missionary Society. The somewhat celebrated "new-light" preacher, Henry Alline, was especially remarkable for his fiery zeal and great success as a revivalist. He labored assiduously in Nova Scotia and New Brunswick from A. D. 1776 until the year of his death, 1814.

Proceeding westward, we find that the first Baptist church on record in Lower Canada (now Quebec) was formed in Caldwell's Manor in 1794 by Rev. E. Andrews of Vermont. Another was organized in the same year in Thurlow, and during the first few years of the present century others at various points in Upper Canada (now Ontario). As in the east so in the west, the early Baptist evangelists were mainly from the New England States, and several of them were missionaries of the above-mentioned missionary society in Boston, Mass., the nucleus of the American Baptist Home Mission Society of the present day. Evangelists from New Brunswick and Nova Scotia were also instrumental in founding several churches in the Canadas.

The first Baptist Association in Canada, that of New Brunswick and Nova Scotia, met at Granville, in the latter province, in 1800. The Haldimand Association, probably the oldest in the West, was organized in 1817.

The Freewill Baptists, who are most numerous in New Brunswick, differ from the Regular Baptists in being "open" communionists, as well as on certain doctrinal points, as implied in the name. The Regular churches are almost uniformly "strict" communionists in practice, though they contain many members who personally hold "open-communion" views. There are also in Ontario and Manitoba over 21,000 Mennonites, who are placed under the head of "Baptists" in the census returns, but who should, probably, be enumerated as a distinct denomination.

There are now (in 1882) altogether, amongst the "Regular," or "Close Communion," Baptists, twenty-one Associations—viz., one for Prince Edward Island, three for New Brunswick, three for Nova Scotia, three for Quebec, and eleven for Ontario. The statistics of membership, according to the Dominion census of 1881, are as follows:

	Regular Baptists.	Freewill Baptists.
Prince Edward Island...	5,588	648
Nova Scotia..................	73,149	10,612
New Brunswick...........	49,489	31,603
Quebec..........................	5,988	2,865
Ontario..........................	88,948	4,274
Manitoba.......................	1,638	35
British Columbia.........	424	10
The Territories............	12	8
Total	225,236	50,055

The total number of actual communicants in the "Regular" churches in Canada, exclusive of British Columbia and the Territories, as given in the Baptist *Year Book* for the same year, is 64,066; total number of churches, 692.

The oldest and most advanced institution of learning belonging to the Baptists of Canada is the University of Acadia College, situated at Wolfville, Nova Scotia. It was founded in 1838, and for more than thirty years has maintained a regular succession of classes in the faculty of arts, and for a few years in that of theology. Somewhat more than two hundred students have taken its degrees in arts in regular course. The governors of the college are appointed by the Baptist Convention of Nova Scotia, New Brunswick, and Prince Edward Island. It has been partially endowed by the voluntary subscriptions of its supporters, and receives also, in common with other denominational schools in Nova Scotia, a small sum annually from the Government. There are in connection with the college, and situated on the same grounds, two flourishing academies—one for male and the other for female pupils.

The Canadian Literary Institute, now Woodstock College, was founded at Woodstock, Ontario, in 1857. Its primary design was to prepare students for the Baptist ministry, and it was organized with a literary and a theological department, into the former of which both sexes were admitted. This college is affiliated with the University of Toronto, and prepares students for matriculation and also for the first-year examination in that university. In 1881 the theological department of the college was removed to the city of Toronto on the opening of "McMaster Hall" in that city. The literary work of the Woodstock College is, however, continued, and an endowment fund approximating $100,000 has recently been subscribed in its aid.

"McMaster Hall" is a fine building erected by the Hon. William McMaster for the use of the Toronto Baptist Theological College. Mr. McMaster has also permanently endowed the president's chair in this institution, which is intended to be henceforth the theological school of the denomination in Ontario and Quebec.

Prairie College is a new Baptist theological institution in the vicinity of Rapid City, Manitoba. It owes its origin to the labors of Rev. John Crawford, D. D., and is constituted on a somewhat novel principle. A large tract of excellent land has been secured, which the pupils of the college, under the direction of the principal, are to cultivate in summer in order to provide funds for the support of themselves and the college, the winter months being devoted to study. This college is regarded as still in the experimental stage. Considerable sums have been contributed in its aid in Ontario and other provinces.

The Baptists in the older provinces are engaged quite extensively in mission work, both at home and in India. The home mission work is carried on under the auspices of the provincial Conventions, each of which supports, or aids in supporting, a considerable number of evangelists, who perform pastoral duties in weak churches or act as missionaries in destitute localities. Until recently the Conventions remitted funds raised for foreign missions to the American Baptist Foreign Missionary Society, and carried on their operations as branches of that society. But a few years since the Conventions of Ontario, Quebec, and the maritime provinces united for the purpose of establishing an independent Canadian society. They have now in operation a flourishing mission amongst the Telugus, where a number of devoted missionaries of both sexes are laboring under their direction. The women of the denomination are rendering valuable aid in the support of these missionaries through the agency of their "mission circles," a considerable number of which have been formed in both the maritime and the more western provinces.

It should be added that the Baptists of Ontario and Quebec are striving to complete their organization and still further consolidate their forces by the formation of a Baptist Union, which it is hoped may eventually be extended to embrace the whole Dominion. The first annual meeting of the Union was held in 1881, but owing to legal and other difficulties the work of organization is not yet completed. (J. E. W.)

BAPTISTS, GERMAN. See DUNKERS.

BAPTISTS, SEVENTH-DAY, a denomination of Christian believers who hold not only that the seventh day of the week was observed as the Sabbath by Christ and his apostles, in common with the whole Jewish nation, but that it was generally so observed by the Christian Church down to the fifth century. It is certain that in portions of the local and fragmentary Eastern churches the practice of keeping the seventh day as a Sabbath still exists; some of the churches, like the Abyssinian, making the Sabbath period cover both Saturday and Sunday. In Europe, throughout the mediæval centuries, there were many local dissident sects, whose names are well known to every student, but whose opinions are involved, for the most part, in no small obscurity. There are abundant traces of the practice of seventh-day observance among these sects, both in the region of the Alps and among the Slavic nations; and it is not unlikely that the obscure Sabbatarian Church now existing in Transylvania may be in some sense a survival from ante-Reformation times. Carlstadt, Sterneberg, and other Reformers in Luther's time had strong leanings towards this view. Soon after this time there were many earnest "Sabbatarians" in England; and it is asserted that there is a line of descent for their opinions back through the Low Countries and Bohemia to the early South Slavic dissenters on the one hand and to the Waldenses on the other. Several early English Sabbatarians were put to death for their opinions, and many others suffered imprisonment and loss of their goods. About the middle of the seventeenth century they began to organize separate churches in England. The Mill-yard church, in the east of London, was gathered about 1670; the Cripplegate church was organized by Rev. Francis Bamfield at some time during Charles II.'s reign; the church at Natton, near Tewkesbury, as early as 1660; and there were congregations at Braintree, Chertsey, Norweston, Salisbury, Sherburne, Wallingford, and Woodbridge. Active persecution was carried on against the new sect during a great part of the reigns of the later Stuarts, and not a few of their ablest and best ministers suffered cruel imprisonments or were pilloried; and John James, the first minister of the Mill-yard church, was hanged, drawn, and quartered, his execution being attended with circumstances of great cruelty. Nevertheless, the Seventh-day doctrine found some stout defenders, even among the clergy of the Established Church, and a number of the ablest of the early Seventh-Day Baptist preachers were originally clergymen of the establishment. The three Stennetts, well known as hymn-writers and authors, were ministers of this denomination.

There are at present only two churches of this persuasion in England, but the mother-congregation at Mill-yard is still prosperous. In 1664, Samuel Mumford, an English Seventh-Day Baptist, went to Newport, R. I., and in 1671 a church was gathered at that place. In 1871 the two hundredth anniversary of this church was held in the quaint old Newport meeting-house. This denomination has always been an influential one in Rhode Island. The denomination in Pennsylvania dates from about 1700; its first minister was Abel Noble, who left England in 1684. A church was organized in Piscataway, N. J., under the pastorate of Edward Dunham, in 1770. The denomination still has an active life in that region. There are now in the United States about 100 churches, with a total membership of not far from 10,000. In Haarlem (Netherlands) there is a Sabbatarian congregation, and the mission in Shanghai, China, dates from 1847.

The *polity* of this denomination is entirely congregational, but since 1802 all or nearly all of the congregations are represented in a "General Conference," which is at once an advisory council in matters of dispute and a corporate body legally qualified to direct the educational and missionary work of the denomination. There are also in the United States five local associations of churches. The denomination supports a missionary society (organized in 1842); a tract society (1843), which also issues several periodicals and publishes several books; and an educational society, dating from 1855. There is a denominational college at Milton, Wis., and at Alfred Centre, N. Y., is the Alfred University, with a theological department and other special courses. Both the college and the university are well endowed, and they are also open to students of either sex.

The *doctrines* of this people are in general harmony with the teachings of what are called the evangelical denominations of Protestants, but they insist on adult baptism of believers and practise immersion; and they specially insist upon the strict observance of the seventh day as the Sabbath. (See *Sabbath and Sunday*, by A. H. Lewis, D. D.)

The so-called German Seventh-Day Baptists are entirely distinct from the above. They are noticed in the article EPHRATA. (D. E. M.)

BARABOO, the county-seat of Sauk co., Wis., is on the Baraboo River, and 175 miles N. W. of Chicago, on the Chicago and North-western Railroad. The river has here a fall of fifty feet, and there are four dams within a mile, furnishing abundant water-power. Baraboo has a brick court-house, a national bank, a weekly newspaper, ten churches, and two public schools. Besides railroad car-shops and round-house, it has two flouring-mills, two saw-mills, two planing-mills, a woollen-mill, a knitting-factory, and two carriage-factories. The country around is noted for its romantic scenery; within three miles is the famous Devil's Lake. Baraboo was first settled in 1838, and incorporated as a village in 1866 and as a city in 1882. Population, 3266.

BARBAROUX, CHARLES-JEAN-MARIE (1767–1794), a French Girondist and orator, was born at Marseilles, March 6, 1767. He was noted for his personal beauty, energy, and eloquence. In 1791 he was sent by his native city as deputy to the Legislative Assembly, and there became intimate with Vergniaud, Brissot, and Roland. He was elected in 1792 a member of the National Convention, in which he displayed superior ability in political economy and in the treatment of the finances. In the trial of Louis XVI. he voted for his death, with an appeal to the people. After the Girondists had been proscribed in May, 1793, he escaped from Paris and sought refuge in the south of France. He was guillotined at Bordeaux, June 25, 1794. Some of his speeches and writings have been preserved.

BARBEL, a name applied primitively to a fresh-water Cyprinid of Great Britain and most other parts of Europe, and subsequently extended to numerous allied species of Europe and Asia, as well as Africa. The typical species have lips with four fleshy barbels—two on each side, one at the snout, and one at the end of the upper jaw—and from these the common barbel has been named. The most important characteristics of the group, however, are the short dorsal fin, of about nine branched rays (besides the anterior simple ones), situated above the ventrals, the short posterior and the unarmed cheeks. the development of three rows of teeth in the pharyngeal bones, and the arched and simple mouth, without folds. The group so characterized embraces about 200 species. which have been distributed among many genera by most authors, but are aggregated under one by Dr. Günther. The common European barbel (*Barbus vulgaris*) may attain a weight of 15 pounds or even more, but is very rarely found of such size. It feeds on worms and other soft invertebrates, as well as small fishes. It is generally shy, but affords considerable sport to the amateur angler. As a food-fish it is little esteemed. No representatives are found in America. (T. G.)

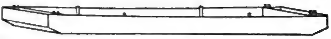
BARDSTOWN, the county-seat of Nelson co., Ky., is the terminus of the Bardstown branch of the Louisville and Nashville Railroad, 39 miles S. of Louisville. It contains St. Joseph's Roman Catholic college and seminary, an academy, an orphan asylum, Nazareth female college, the mother-house of the Sisters of Charity, and six churches. It was formerly a manufacturing town, supplying a large district with hats, shoes, ploughs, wagons, etc. It has now three hotels, a weekly newspaper, three flour-mills, and there are twenty distilleries in the county. It was incorporated in 1788 by the legislature of Virginia under the name of Bairdstown, after David Baird, one of the original proprietors. Among its former residents of note was John Fitch, the inventor of the steamboat. Its population in 1880 was 1803, being less than in 1870, and about the same as for forty years previous.

BARFOD, PAUL FREDERIK, a Danish historian, was born April 17, 1811, in Lyngbye. He belongs to the Grundtvigian party, and is a passionate advocate of the union of the Scandinavian countries, and lets no opportunity of saying a word in its favor pass unimproved. From 1839 to 1842 he edited the quarterly magazine *Braga og Iduna*. His chief work is *Narratives from the History of the Fatherland* (4th ed. 1873), which a marked patriotic sentiment and a charming style have made very popular. In 1874 he published *Pictures from the History of the North*. Others of his works are—*History of Denmark and Norway under Frederik III.*; *King Christian's Diary*; *Lectures on Northern Antiquity*; *A Journey in Dalarne* (1863); and a *History of Denmark* (9th ed. 1879). He has taken a prominent part in Danish politics.

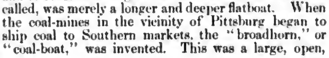
BARGAIN AND SALE. A species of conveyance commonly used both in England and the United States to transfer titles to real estate. By the rules of the common law it was necessary in early times, in order to transfer the title of land to another, that a certain ceremony should be gone through with, known as a feoffment with livery of seisin. This consisted of an actual symbolical transfer of the property on the spot by one party to the other by means of handing over a turf from the land or a twig from a tree. It was usually transacted in the presence of witnesses, and was accompanied by a writing under seal known as a deed of feoffment. The introduction of the system of uses into England speedily, however, furnished another and less troublesome mode of transferring title. Wherever parties contracted for the sale and purchase of land, and the purchase-money was actually paid, the court of chancery considered that the property ought in conscience to belong to the person who had paid the money, and therefore held the bargainer or vender to be immediately seised of the land to the use of the purchaser. In this way the actual beneficial title to land could be passed without the cumbrous ceremony of livery of seisin.

By stat. 27 Hen. VIII. c. 10, commonly called the Statute of Uses, a material change was made in the existing law as regards still further interests. Every use was by that statute vested in possession; that is, where any person stood seised of any lands to the use of another, it was enacted that the person holding such use should be deemed in lawful seisin and possession of the lands. By the operation of this statute the purchaser of land under a simple contract of sale, having paid the purchase-money, became actually seised or possessed thereof to all intents and purposes,—persons being in consequence enabled, however, to transfer their estates without that notoriety which the common law was so solicitious to procure. Parliament in the same year, by stat. 27 Hen. VIII. c. 16, provided that no estate of freehold or inheritance in land should pass by virtue of a mere contract of sale without a deed of bargain and sale duly indented and enrolled within six months from its date in the office of the court. This was the origin of the deeds of bargain and sale, now generally disused in England, but almost universally adopted throughout the United States. A valuable consideration of some kind passing from the grantee to the grantor is an indispensable requisite of every deed of bargain and sale; hence the invariable insertion of a clause in the deed stating that such a consideration has been paid. (F. H.)

BARGE. The barge is a large, long, shallow boat, sometimes decked entirely over and sometimes open, used for the unloading of ships at anchor in harbors or for the transportation of coarse freight along the rivers and safe parts of the coasts of the United States. The barge is essentially a shoal-water boat, being designed to carry the largest load with the least possible draft of water. Barges are always flat-bottomed. They first came into use extensively in the United States on the Ohio and Mississippi rivers and branches, being for many years the chief reliance of the inhabitants for freighting purposes between points reached by the rivers. The first steamboat appeared on the Western rivers in 1811, and after 1818 many vessels of that type were built for the river-trade. The flatboat and barge remained the popular style of craft, however, for heavy freighting. The flatboat was the first form of boat. It was flat-bottomed, had square ends, the bow and stern raking at an angle of 30°, and was propelled in deep water with oars and large sweeps, and in shallow water was pushed along with poles thrust against the sandy bottom. Sometimes there were houses on the deck of the boat, to protect the family of the boatman and to cover the cargo from the rain. The barge, so called, was merely a longer and deeper flatboat. When the coal-mines in the vicinity of Pittsburg began to ship coal to Southern markets, the "broadhorn," or "coal-boat," was invented. This was a large, open, flimsily-built boat, propelled by sweeps, and intended to be left behind at Memphis, Vicksburg, or New Orleans, to be taken apart by the boat-breakers and sold for lumber. Another form of barge came into use about forty years ago, intended for a higher grade of business. This was the "model barge," a long, low, broad hull, with a regularly moulded steamboat bow, the stern being exactly like the bow. This barge has straight sides, and is perfectly flat on the bottom for five-sixths of its length. It is framed and planked as lightly as possible, and gains longitudinal strength from one or more fore-and-aft wooden bulkheads. The later model barges are strengthened by a heavy iron rod running

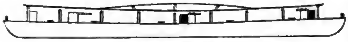


Flatboat.



Broadhorn.

the full length of the boat, hooking under the keelson at bow and stern, and supported amidships by several posts or "braces" resting on the keelson. The barge is usually covered with a house, or "cargo-box," nearly from end to end, to protect the cargo. A large number of this class of boats are employed in the iron-ore, building-stone, and heavy river-freighting of St. Louis and the upper Mississippi. Others are used on the Ohio River. The largest class of them run from St. Louis, Cairo, and Belmont to New Orleans in the export grain-trade, the grain being carried in bulk either in the hold or in the cargo-box. The use of barges is growing. The business of the Ohio River is now confined chiefly to towing boats of this class laden with coal and iron, while towing is a large feature of the trade of all the Western rivers.


Model Barge.

The flatboat of to-day is 90 feet long, 16 wide, and 5½ deep, decked only now and then. The square barge is of the same model as the flatboat, but is larger; the usual size is 130 feet long, 25 wide, and 8 deep, the cargo being 425 tons; a few are 165 feet long. They average five trips a year from Pittsburg to the Southern markets. The coal-boats are 170 feet long, 26 wide, and 9½ deep; they carry coal to the extreme Southern markets, and when not broken up average one trip a year. The model barges are of all sizes, up to 235 feet in length, 35 in breadth, and 9½ in depth, with a cargo-box 9 feet high. The new barges for the grain-trade are all of this size, having a capacity to carry 50,000 bushels, or 1300 tons, on 8-feet draft of water.

The coal-carrying flats and boats are built on the banks of the small tributaries of the Ohio, Monongahela, and Kanawha, principally near the coal-mines. They lie in fleets in these streams during low water, heaped full of coal, laden almost to the edge of the gunwale, and waiting for a rise of the river. A thaw or a week of rain swells the current of the stream, and the fleet is liberated *en masse*. Every towboat is called into requisition. The flats, barges, and broadhorns are collected into groups of ten or twelve, and are lashed side by side into a long, narrow squadron. The sterns of two barges in the centre of the tow rest against the square deck at the bow of the steamer, while the sterns of the barges in the outer files of the tow overlap the steamer a third of their length. The stern of the towboat thus projects far in rear of the fleet, leaving the paddle-wheel at the stern of the steamer perfect freedom of action. Every rise of the river is improved instantly. When there are six feet of water over the sandbars the river becomes a scene of sudden activity. Towboats dart down stream in rapid succession, pushing squadrons of barges before them. One is not out of sight around the bend of the river below before another comes into view around the bend above; often several are in sight at the same moment. The squadrons intended for the lower Mississippi "double up" after passing the canal at Louisville. The towboat Harry Brown has recently towed barges carrying 14,000 tons of coal from Louisville to New Orleans; the Ajax towed thirty-two barges, laden with 22,500 tons in all, to the same destination. The cost of freighting coal in this manner from Pittsburg to New Orleans is 80 cents per ton.

The general trade of the Western rivers was greatly injured by the war and by the subsequent completion of the Ohio and Mississippi and other railways. In 1872 there was a revival of the river-business, owing to the opening of the canal around the falls at Louisville. In 1873-74 tolls at the canal were reduced from 50 cents a ton to 10 cents, and finally they were abolished. Steamboats and barges were then built in great numbers, and business revived. Latterly, a grain export-trade from the winter wheat region on the upper Mississippi and Missouri, *viâ* New Orleans, has sprung up. Large model barges were built by the following transportation companies: the Mississippi Valley, the St. Louis and New Orleans, the American, and the Mound City, carrying 50,000 bushels of wheat. A towing steamer could take five or six of these barges, loaded with grain in bulk, accompanied by a flatboat loaded with the steamer's coal, to New Orleans at one-half the cost charged by the railway lines for transportation to New York. The export-trade *viâ* New Orleans grew rapidly in consequence, as shown in the following table, giving the shipments of bulk grain from St. Louis to New Orleans:

Year.	Bushels.	Year.	Bushels.
1870	66,000	1876	1,774,379
1871	312,077	1877	4,101,353
1872	1,711,039	1878	5,451,603
1873	1,373,969	1879	6,164,838
1874	1,423,046	1880	15,762,664
1875	308,578		

In 1880 the cost of shipping bulk grain from St. Louis to New Orleans was from 7 to 9½ cents a bushel, as against 20 and 25 cents by rail to New York. The cost in 1883 is 5 and 5½ cents to New Orleans. The theory is that at 5 cents a bushel to New Orleans, and at an ocean-rate of freight 4 cents more than is charged from New York, grain can be exported *viâ* the Mississippi at greater profit than *viâ* the Atlantic ports. The transfer of the grain to the ship in New Orleans by floating elevators is effected at small expense, the ship lying at anchorage in the stream and saving wharf-charges.

In the East barges are used chiefly in the ice- and coal-trades of the Hudson River, New York harbor, and Long Island Sound. They are towed by small propeller tug-boats, the tow floating astern of the tug. The barges are flat-bottomed and have square sides and ends, the bow and stern usually raking at an angle of 30°. A number of model barges, with cargo-houses, are employed on the Hudson River in bringing ice from the storage-houses to New York City. It is estimated that the coal- and ice-barges above mentioned have taken the place of about 300 sloops and schooners formerly employed in the trade. (H. H.)

BARING-GOULD, Sabine, an English clergyman, was born at Exeter Jan. 28, 1834, a relative of Lord Ashburnham. He entered Clare Hall, Cambridge, and took his master's degree in 1856; took orders in the Church 1865; was curate at Horbury, incumbent at Dalton and Thirsk, Yorkshire (1869), and rector (1871) of East Mersea. Among his works are *The Paths of the Just* (1854); *Iceland, its Scenes and Sagas* (1861); *Post-Mediæval Preachers* (1865); *The Book of Were-wolves* (1865); *Curious Myths of the Middle Ages* (1866); *Curiosities of the Olden Times* (1869); *The Silver Store* (1868); *In Exitu Israel*, a novel (1870); *The Origin and Development of Religious Belief* (1870), in two volumes—the first discussing the origin of heathenism and "Mosaism," the second relating to Christianity; *The Golden Gate* (1869-70); *Legends of the Patriarchs and Prophets* (1871); *Gabrielle André*, a novel; *Legends of Old-Testament Characters* (1871); *Lost and Hostile Gospels; Lives of the Saints* (15 vols., 1872-77); *Some Modern Difficulties* (1875); two remarkable lectures on Luther's doctrine of justification by faith; *Village Sermons* (1875); the appendix to Henderson's *Folk-lore* (1876); *The Mystery of Suffering* (1877); *The Vicar of Morwenstow* (1876), a biography of Rev. R. S. Hawker; and *Germany, Present and Past* (1879), which treats of the institutions and manners of that country. His works abound in curious learning and quaint thought. He wrote the popular hymn, "Onward, Christian Soldiers!" He for two years edited *The Sacristy*, a quarterly publication.

BARKER, Jacob (1779-1871), was born in what is now Perkins, on Swan Island, in the Kennebec River, Maine, Dec. 17, 1779, and was brought up on the island of Nantucket. He was third cousin in the paternal and fourth cousin in the maternal line to Benjamin Franklin. He went one year to school, and at the age of seventeen began mercantile life in New York. During his minority he extended his trade to foreign countries and became owner of three ships and a brig. Prior to the War of 1812 he became a student of political economy, an attorney-at-law, a banker, and the largest ship-owner in the United States with the exception of William Gray of Boston. In 1806 he imported Robert Fulton's steam-engine. He early took an active part in politics, espousing the cause of Jefferson, defending the Embargo and the Non-importation Acts, and advocating the purchase of Louisiana. He opposed the war with Great Britain in 1812, but when the conflict had begun he supported the war-policy of Madison. In 1813 he made a loan of $2,400,000 to the United States, and in 1814 made a further loan of $5,000,000, at a time when no other taker could be found. After the war he was elected to the New York senate, where he was among the first to advocate the building of the Erie Canal. He was a supporter of Gen. Jackson, and is said to have first nominated him for the Presidency. In 1834 he moved to New Orleans, where with reference to slavery he put into practice the opinions of the Friends, from whom he sprang. He opposed the Rebellion, but remained in Louisiana during the war of 1861–65. He was elected to Congress from New Orleans in 1865, but was not permitted to take his seat. His independence of judgment and evident sincerity and unselfishness gave his opinions weight with such men as Madison, Hamilton, and Clinton, and his mental powers were backed by the highest physical endurance and courage. He died in Philadelphia, Dec. 26, 1871.

BARNACLE, a kind of goose, the *Anas* or *Anser bernicla* of authors, now usually called *Bernicla leucopsis*. The name is derived from the vulgar error that these birds originated in the cirriped crustaceans called by the same name. The orthography varies in all the vowels and some of the consonants: it is supposed by Max Müller to be equivalent to "Irish"—*i. e.*, *Avis Hibernica*, or *Hibernicula;* Skeat considers *barnacle* (the crustacean) as Lat. *bernacula*, probably for *pernacula*, dimin. of *perna*, a kind of shell-fish; Wedgwood compares Gael. *bairneacle*, a limpet. See GOOSE. (E. C.)

BARNARD, FREDERICK AUGUSTUS PORTER, LL.D., an American educator and author, was born at Sheffield, Berkshire co., Mass., May 5, 1809. He was descended on the father's side from Francis Barnard of Coventry, Warwickshire, England, who migrated in 1636 to Dorchester, Mass., and on the mother's from John Porter, also of Warwickshire, who arrived in Massachusetts in 1628. His elementary education was received chiefly from his mother, but he was fitted for college at Saratoga Springs and at Stockbridge, Mass. He entered Yale College in 1824, and graduated in 1828 with high honors. After teaching two years in the Hartford grammar school, he became a tutor in Yale College. In the fall of 1832 he became connected with the institution for the deaf and dumb in New York City, and while holding this position published an *Analytic Grammar*. In Dec., 1837, he was elected professor of mathematics and natural philosophy in the University of Alabama at Tuscaloosa, and in 1849 was transferred to the chair of chemistry and natural history in the same institution. In 1854 he was elected professor of mathematics and natural philosophy in the University of Mississippi at Oxford, and in 1856 president of that university—a title changed to chancellor in 1858. In 1846, Gov. Martin of Alabama appointed Prof. Barnard astronomer to a commission organized to determine the boundary between that State and Florida. His report was adopted as a basis for settling the matters in controversy by the legislatures of both States. During his residence in the South, Dr. Barnard wrote largely for the periodical press, published many papers on topics of educational and scientific interest, and delivered many public addresses. In 1858 he prepared an elaborate report on the history, methods, results, and value, practical and scientific, of the United States Coast Survey. In 1860 he was a member of the astronomical expedition sent to Cape Chudleigh in Labrador to observe the solar eclipse. He was elected president of the American Association for the Advancement of Science in August of the same year, and held that office until Aug., 1866. In the act of Congress passed in 1863 incorporating the National Academy of Sciences he was named as one of the original corporators. In 1874 he was chairman of the physical section of the academy, and from 1874 to 1880 was foreign secretary. On the outbreak of the Civil War, in the spring of 1861, Dr. Barnard resigned his position as chancellor of the University of Mississippi, but was unable to obtain permission to leave the Confederate States. Finally reaching Washington, he was for some time engaged in astronomical work under the director of the Naval Observatory. In the spring of 1863 he received an appointment as assistant in the Coast Survey, and was placed in charge of the map and chart department. In May, 1864, Dr. Barnard was elected president of Columbia College in New York. In Dec., 1866, he was appointed one of the Government commissioners to visit and report on the universal exposition of 1867 at Paris. His contribution to the reports of that exposition forms the third volume of the series, and is very elaborate. In 1878 he was appointed assistant commissioner-general to the exposition of that year, after the close of which he received the cross of officer of the Legion of Honor from the French ministry. In 1876 he was appointed one of the board of judges of the International Centennial Exhibition at Philadelphia on instruments of precision. In 1872 he published a volume on the *Metric System of Weights and Measures* (3d ed., enlarged, 1879). He prepared part of Field's *Outlines of a Code of International Law* (1872) and of Harper's *First Century of the Republic* (1876). During the past twenty years he has contributed various papers on scientific, educational, and economical topics to public journals and to the proceedings of the various societies with which he is connected. From 1873 to 1877 he was editor-in-chief of *Johnson's Cyclopædia*. He received the honorary degree of doctor of laws from Jefferson College, Mississippi, in 1855, and the same degree from Yale College in 1859.

BARNARD, HENRY, LL.D., an American educator and author, was born at Hartford, Conn., Jan. 24, 1811. He graduated at Yale College in 1830, studied law, and was admitted to the bar in 1836. He was elected to the legislature of Connecticut in the next year, and during his three years of service did much for the improvement of prisons, the care of the insane poor, and especially the reorganization of the public-school system of that State. He was State superintendent of schools from 1838 to 1842, and again from 1850 to 1854. Among the improvements which he introduced were public high schools, teachers' institutes, and a normal school. He also effected a general improvement in the construction of school-houses. From 1843 to 1849 he held a similar position in Rhode Island, and was equally successful there. In 1857 he was made president of the State University of Wisconsin, and held this position two years. In 1865 he was president of St. John's College, Annapolis, Md., and in 1867 he was appointed U. S. Commissioner of Education, but resigned in 1869. He has been a diligent author, all of his publications having reference to education. His works include *School Architecture* (1839); *National Education* (4 vols., 1840; revised ed. 1878), treating of elementary, secondary, and superior education in the various countries of Europe; *Normal Schools and Teachers' Institutes* (1850); several volumes giving an account of the most eminent teachers and educational reformers of Germany, France, Switzerland, England, and America. He has been editor of the *Common School Journal* (1838–42), *Rhode Island School Journal* (1845–49), and since 1856 he has edited the quarterly *American Journal of Education*.

BARNARD, John Gross, LL.D. (1815–1882), an American military engineer, brother of Pres. F. A. P. Barnard, was born at Sheffield, Mass., May 19, 1815. He graduated at West Point in 1833, and was commissioned as brevet second lieutenant in the corps of engineers. After assisting in the construction of Fort Schuyler, he was employed in improving and fortifying the harbors of Pensacola, Mobile, and New York. During the war with Mexico he superintended the defences of Tampico, and also served in the field, receiving the brevet of major for his meritorious services. Before and after this war he was engaged for several years in the construction of Forts Jackson and St. Philip and other defences of New Orleans. In 1850 he was appointed chief engineer for the exploration and survey of the isthmus of Tehuantepec, with a view to building a railroad by which the Pacific coast might be more readily reached. He was next employed in works on the North Atlantic coast, and in 1854 had charge of the fortifications of San Francisco harbor and other places on the Pacific coast. He was superintendent of the U. S. Military Academy at West Point for one year (1855–56), and afterwards superintended the defences of New York harbor. On the outbreak of the Civil War he was made chief engineer of the department of Washington. As chief engineer of the Army of the Potomac in the Virginia Peninsular campaign, he constructed the siege-works at Yorktown and offensive and defensive works before Richmond. For the next two years he was chiefly engaged in the construction of extensive works around Washington. In 1864 he became chief engineer under Gen. Grant, and served on his staff in the siege of Petersburg and in various operations around Richmond until the surrender of Gen. Lee's army. At the close of the war he was made brevet major-general of the regular army, and Dec. 28, 1865, he was appointed colonel of the corps of engineers. He was at that time senior engineer of the defences of New York harbor, and was afterwards a member of the board of engineers for fortifications and river and harbor improvements until his retirement from active service, Jan. 1, 1881. He had also served on the Lighthouse Board from 1870 to 1879, and was a member of many special boards and commissions. He was one of the original corporators of the National Academy of Sciences, and a member of other scientific societies. Yale College conferred on him the degree of LL.D. in 1864. He died at Detroit, May 14, 1882. Among his published works are *Dangers and Defences of New York* (1859), *Notes on Sea-coast Defence* (1861). He was joint-author with Gen. Barry of *Reports of the Engineer and Artillery Operations of the Army of the Potomac* (1863), and joint-author with Gen. H. G. Wright and Col. P. S. Michie of *Report on the Fabrication of Iron for Defensive Purposes* (1871–72). He also prepared reports on the *Defences of Washington* (1871) and on the *North Sea Canal of Holland* (1872). In 1858 he prepared a mathematical treatise on the *Phenomena of the Gyroscope*, and in 1872 he enlarged and extended this under the title of *Problems of Rotary Motion*. His high scientific attainments, his enthusiastic devotion to his profession, and his careful regard for the public interests made his services most valuable to his country.

BARNBURNERS. The extent, population, and wealth of the State of New York have always worked to the disadvantage of its great leaders, and have made its politics a bewildering subject of study. Its 33 to 42 electoral votes, taken from one side and given to the other, have made the usually decisive difference of 66 to 84 votes, from one-third to one-fifth of the total vote; and since 1828 the State has been on the losing side but three times—in 1856, 1868, and 1876. The leader of the dominant party of the State has thus always been too prominent to escape combinations of other States against his nomination for the Presidency, and too powerful to be safely treated as a subordinate. Jefferson, Madison, and Monroe succeeded in evading the difficulty by taking Burr, Clinton, and Tompkins as Vice-Presidents; Jackson, Pierce, and Lincoln, by taking Van Buren, Marcy, and Seward respectively as Secretaries of State. In all other cases the President has found the New York leader of his own party a thorn in his side: the struggles of Madison with De Witt Clinton, of Polk with Silas Wright, of Fillmore with Seward, of Grant with Fenton, of Garfield with Conkling, and of Arthur with Cornell, are familiar instances. The usual process, then, has been (1) the election of a President; (2) the development of an administration faction in New York, beginning at the custom-house; (3) a bitter contest between the State "machine" and the Administration "machine;" and (4) the overthrow of the former or the loss of New York to the dominant party in the next election. This general rule will furnish some clue to the maze of New York politics, and particularly to the great feud of the Barnburners and Hunkers, which extended really from 1837 until nearly 1860, and assumed national proportions in 1848.

From about 1824 until nearly 1850 the New York Democratic party was controlled by a knot of unofficial leaders usually known as the "Albany Regency." Their especial characteristic was an almost infallible shrewdness in perceiving and guiding the natural advance of their party, and they were thus usually found in sympathy with its "radical" wing, however weak. The first instance came in 1836–40. Banks in New York existed hitherto by special charter or with special privileges, and the charters were often obtained by open bribery and corruption. The financial difficulties which resulted in the panic of 1837 also developed in 1835–36 the "Equal Rights" or "Locofoco" faction in New York City, opposed primarily to any grants of special privileges by charter. Jackson's war on the United States Bank, supplemented by Van Buren's advocacy of the Sub-Treasury system as a substitute for the deposit of United States funds in State banks, brought the Locofocos back to their party, and enabled the Whigs for some years to give the name of Locofoco to all their opponents. Further, it brought about the free banking law of 1838, and in the new State constitution of 1846 forbade the grant of any special privileges by charter. The "agrarian" notions of the Locofocos were not confined to banks. They advocated also an elective judiciary and a cessation of work on unproductive canals; and both of these items were accepted by the radical Democrats and the Regency, and incorporated in the constitution of 1846. But before this last step was taken the radicals had forced through the "stop-and-tax" law of 1842, directing a cessation of work on unproductive canals, and direct taxation and other means to clear off the canal debt; and in 1845, Gov. Silas Wright, the recognized head of the Regency, had openly taken the radical side by vetoing a bill passed by the Whigs and "conservative" Democrats appropriating money for work on the unfinished canals. In this schism between radical and conservative Democrats lay the seeds of the Barnburner and Hunker division.

In 1844, Van Buren, who did not favor the annexation of Texas, was defeated in the Democratic national convention, and Polk was nominated for the Presidency. Wright was complimented with the nomination for the Vice-Presidency, but refused it and accepted the State organization's nomination for the governorship. Polk's majority in New York was 5106, while Wright's was 10,033. Polk has been taxed with ingratitude to Wright in forgetting his essential assistance in carrying the State, and with a mean anger at Wright's superior majority. But Polk knew enough of "practical politics" to take in the New York situation fully, with all its pregnant indications. The State machine had shown, in the finest style of "politics," that its assistance was necessary to the election of a Democratic President in 1848, and that its independence must be respected. Wright's election as governor was a proffer of peace or war to the Administration, and peace or the Administration's defeat meant Wright's nomination for the Presidency in 1848. Polk chose war. It is certain that pronounced allegiance to the Administration was at once as sure a card for appointment to Federal office in New York as allegiance to the State "machine" was a bar to it. The immediate result was the rise of the Hunker and Barnburner factions—the former "hunkering" for Federal office; the latter willing, like the stupid Dutch farmer in the story, to burn down its barn, the Federal Administration, in order to expel the rats.

The whole weight of ability was with the Barnburners. Of the old Regency, Van Buren, Silas Wright, Benjamin F. Butler, Samuel Young, Azariah C. Flagg, John A. Dix, and Dean Richmond were with them; and of the rising party-leaders they had William Cullen Bryant, Preston King, James S. Wadsworth, David Dudley Field, Ward Hunt, George Opdyke, John Van Buren, C. C. Cambreleng, Sanford E. Church, Samuel J. Tilden, and Michael Hoffman. Of the Regency, only William L. Marcy and Edwin Crosswell of the Albany *Argus* took the Hunker side, with ex-Governor William C. Bouck, Samuel Beardsley, Daniel S. Dickinson, and Horatio Seymour; and their organization had little of the enthusiasm and community of feeling which characterized their opponents. Many of the latter were anti-slavery men on principle, and therefore entered the Republican party in 1856; and the rest were anti-slavery men out of a policy of retaliation, since Southern votes had beaten Van Buren in 1844, and the President, Polk, was a Southerner and slave-owner. The "Wilmot proviso" in 1846–47, forbidding slavery in territory to be acquired from Mexico, was therefore promptly adopted by the Barnburners. At the State convention of 1846 the Hunkers hardly had sufficient strength to make open resistance to Wright's nomination for the governorship, but a more effectual resistance to him was made at the polls. The vote for him fell from 241,089 in 1844 to 187,306 in 1846. He was defeated, retired to his farm, and there died, Aug. 27, 1847. We have no sufficient space to illustrate by citations the thirst for vengeance which henceforth controlled the Barnburners. Wadsworth's passionate declaration that "though it is too late to do justice to Silas Wright, it is not too late to do justice to his assassins," became the rallying-cry of his party. Their feeling was increased by the treacherous efforts of the Hunker minority to capture the State machine. The State convention met at Syracuse, Sept. 29, 1847, a great number of delegations being contested. The leaders on both sides informally agreed to settle the "frivolous" contests first, but the Hunker leaders, by very sharp practice, seated their contestants, tabled the Wilmot proviso resolution, and attacked the management of the party. The Barnburners, in conjunction with most of the Democratic members of the legislature, then called a convention at Herkimer (afterwards changed to Utica), for Feb. 16, 1848, to select delegates to the national convention, while the Hunkers called a similar convention at Albany, for Jan. 26. As the whole State machine was in the hands of the Barnburners, the Hunker convention found itself composed mainly of self-appointed delegates, with very little representation from the primaries. Nevertheless, it ordered delegates to the national convention to be chosen by Congressional districts, taking the precaution to appoint new local committees to manage the primary elections. Two separate machines were thus developed, and two sets of delegates were chosen, whose conflicting claims could not well be reconciled. The national convention, May 22, 1848, sought to reconcile them by offering to admit both, dividing the thirty-six votes of New York between them. Thereupon both withdrew—the Hunkers, with a promise to support the convention's nominees; the Barnburners, with a defiant refusal to make any such pledge. The whole object of the latter was now to hold their machine well together, accept the alliance of any element that offered assistance, defeat the Democratic nominee, Cass, a "renegade from the Wilmot proviso," in New York, and either force a compromise which should leave them undisturbed by future Democratic administrations or pull down pillars and temple together. June 22d they met in State convention at Utica, and nominated Martin Van Buren and Henry Dodge of Wisconsin for President and Vice-President. The latter refused the nomination. In the mean time a call had been issued for a general free-soil convention at Buffalo for Aug. 9. In this convention the Barnburners took part, and were thus absorbed, for the time, into the more national free-soil movement. (See FREE-SOIL PARTY.)

In the election of 1848 the Barnburners attained both their sentimental object of polling a larger popular vote in New York than the Hunkers, and their more practical object of giving New York's thirty-six votes to Taylor, thus electing him by 163 votes to 127 for Cass. But, wonderful as the strength of their machine had proved itself, they had now tested it up to the breaking-point. The old leaders could hold the mass of the party together no longer against the national party. Some of them, like Van Buren and Tilden, retired from politics; others, like Preston King, remained in the hopeless Free-Soil party; and others "walked arm-in-arm in the funeral" to the Hunker organization. In 1849 both factions attended the same State convention, and united in a vague and shadowy resolution on the slavery question. In 1850 the old Barnburners, under John Van Buren, could muster but twenty votes against the State convention's resolution that it was "proud to avow its fraternity with and devotion to" the principles laid down by the national convention of 1848. The decease of the Barnburner faction, and the Hunker control of the State, were thus officially declared. But the familiar process was to be repeated with the Hunkers themselves. There were already some traces of a division of their faction into "Soft Shells" and "Hard Shells," or Softs and Hards, though it is hard to say what was the line of division, except that the Softs had rather more of the old Barnburner element than the Hards. Gov. Horatio Seymour was so acceptable to both that he kept them together until 1853, when both factions nominated tickets for minor State offices. The average Soft vote was 96,698, the average Hard vote 95,529; and the Whigs were successful. The new President, Pierce, took the Soft leader, Marcy, into his Cabinet, but tried to maintain amicable relations with both factions. This policy was fairly successful until the passage of the Kansas-Nebraska bill in 1854, abrogating the Missouri compromise and its prohibition of slavery north of latitude 36° 30′ and west of the Mississippi, except in Missouri. The Softs generally took open ground against the bill, though Marcy, at their request, remained in the Cabinet; and the election of 1854 for governor became the most disorganized contest in New York's history. Gov. Seymour was nominated by the Softs, Bronson by the Hards, Ullman by the "Know-Nothings," and Clark by a fusion of Whigs and Prohibitionists, supporting a prohibitory liquor law which Seymour had vetoed at the previous session. Clark was the successful candidate, receiving 156,804 votes to 156,495 for Seymour, 33,850 for Bronson, and 122,282 for Ullman. Hereafter, for ten years and more, the State Democratic organization was left almost in a state of suspension, maintaining its strength mainly on accessions of discontented Whigs, Know-Nothings, and Republicans. The old aggressive leadership, which had made it almost an ideal political organization, had either gone into the Republican party or perished in the New York wars of the roses, the conflicts between Barnburners and Hunkers.

Most of the authorities for this period are in contemporary newspapers or in such pamphlets as *New York Hards and Softs*, which are out of print and difficult of access to the general reader. One, however, Gardiner's *The Great*

Issue, is not uncommon in libraries, and contains most of the documents on the subject. The Barnburner view will be found in Hammond's *Life of Silas Wright*, and more briefly in Cook's *Life of S. J. Tilden*, 45; the Hunker view in 27 *Democratic Review*, 372; Cutts's *Party Questions*, 155; and Jenkins's *Life of Silas Wright* and *Governors of New York*, 705, 779, the last named being the fairest; and a general view in 3 Von Holst's *United States*, 358, and 2 Wilson's *Rise and Fall of the Slave Power*, 125–158. For the preliminary Locofoco movement see 2 Von Holst's *United States*, 396; Byrdsall's *History of the Locofoco or Equal Rights Party*; Sedgwick's *Life and Writings of Leggett*; 2 Hammond's *Political History of New York*, 489–504. See also authorities under **FREE-SOIL PARTY**. (A. J.)

BARNES, WILLIAM, B. D., an English clergyman, philologist, and poet, was born at Rushhay, Bagber, in the parish of Sturminster Newton, Dorset, England, in 1810; the tenth in descent from William Barnes, who held land from Henry VIII. in the royal forest of Gillingham. The family afterwards lost their land, becoming tenant-farmers at East Stower, Marnhull, and Manston. William Barnes, after a homely schooling, entered a lawyer's office, but having a strong desire for learning gave his spare time to literature. He opened a school at Mere, where he married, and afterwards removed to Dorchester, where he kept his school till 1862. He embraced opportunities of studying Persian for the sake of its school of poetry, and Hindustani that he might assist his pupils who wished to enter the Indian Civil Service. He also attended Cambridge University, and by persevering efforts obtained his degree. In 1847 he obtained the curacy of Whitcombe-by-Dorchester, and in 1862 was presented to the rectory of Winterborne Came. He is the author of *Poems of Rural Life in the Dorset Dialect*, *A Grammar and Glossary of the Dorset Dialect*, *The Old Dialect of the English Colony of Forth and Bargy in Ireland*, *An Anglo-Saxon Delectus*, *A Philological Grammar formed from a Comparison of more than Sixty Languages*, *Britain and the Ancient Britons*, *Views of Labor and Gold*, *Tiw*, *or*, *A View of the Roots and Stems of English as a Teutonic Tongue*, *England and the Saxon English*, *An Outline of Speechcraft*, *An Outline of Redecraft* (*Logic*.) He has also prepared school-books on *Linear Perspective*, *Geography*, *and Ethnology*, and *Exercises in Practical Science*. His *Rural Poems in Common English* have been issued in a handsome illustrated edition (Boston, 1868). He has contributed articles to *Macmillan's*, *Fraser's*, and other magazines.

BARNESVILLE, a town of Pike co., Ga., on the Macon and Western Railroad, 63 miles S. of Atlanta, at the junction of the Upson County Railroad. It has a savings bank, a public library, a law library, a high school and other good schools, three churches, a weekly newspaper, an iron-foundry, a planing-mill, two grist-mills, and two carriage-factories. Before the Civil War only a railroad station, it has since grown rapidly. Population, 1962.

BARNESVILLE, a town in the S. W. part of Belmont co., Ohio, 27 miles W. of the Ohio River on the Baltimore and Ohio Railroad. It has a national bank, a weekly newspaper, is the seat of Olney College, conducted by Friends, and is well supplied with churches, schools, public halls, and libraries. It has a foundry, planing-mill, woollen-mill, carriage-factory, six cigar-factories, and manufactories of hydraulic cement. Population, 2435.

BARNEY, JOSHUA (1759–1818), an American commodore, was born in Baltimore, Md., July 6, 1759. Having left school at the age of ten, he was in Jan., 1772, apprenticed to his brother-in-law, who commanded a small brig in the Liverpool trade. Barney continued in the merchant service three years, and during the last voyage, on the death of the captain, took command of the vessel. He safely completed the voyage to Italy, and returned to Baltimore nine months later. The owner, pleased with his admirable behavior, saluted him as Captain Barney. The American Revolution had now begun, and Barney was appointed master's mate in the sloop Hornet, which was fitted out in Baltimore, and joined Com. Hopkins's squadron at Philadelphia in Nov., 1775. After capturing New Providence in the Bahamas, the fleet returned to Philadelphia, and Barney, being transferred to the sloop Wasp, was soon after promoted to a lieutenancy. He served at Red Bank in the brig Andrea Doria, and was transferred to the frigate Virginia as first officer. In attempting to pass the mouth of the Chesapeake the Virginia ran aground and was captured. After five months' confinement in a prison-ship at New York, he was exchanged and again captured. He was now sent to England and confined in Mill Prison, but some months later managed to escape in the undress uniform of a British officer. After various adventures by sea and land he reached Philadelphia, and was promoted to a captaincy, taking command of the famous ship Hyder Ali. While convoying a fleet of merchantmen down the Delaware he captured the British ship Gen. Monk after an engagement of twenty-six minutes. For this exploit he, then only twenty-three, was promoted by Congress to the rank of commodore, and received a gold-hilted sword from the State of Pennsylvania. After performing successfully a secret mission to the West Indies, he was sent to France with despatches, and was presented at court by Dr. Franklin. When the preliminary treaty of peace with Great Britain was signed in 1783, Com. Barney was appointed to deliver it to Congress. He now retired from the service and formed a mercantile partnership in Baltimore. In 1795 he entered the French navy under the Directory, with rank corresponding to that which he had previously held in the American navy. Being placed in command in the West Indies, he protected French commerce there from British cruisers. In 1802 he resigned and returned to Baltimore. On the outbreak of the war of 1812 he was appointed commander of the gunboat flotilla organized for the defence of Chesapeake Bay. Two years later, when the city of Washington was threatened, Com. Barney was summoned to its protection, and at the battle of Bladensburg, Aug. 26, 1814, his sailors did all the fighting that was done on that disgraceful day. He himself was wounded and taken prisoner. Six weeks later he was exchanged, and resumed his command. He afterwards received an elegant sword from the city of Washington as a testimonial to his gallantry. In 1817, Pres. Monroe appointed Com. Barney naval officer of the port of Baltimore. In 1818 he set out with his family for Kentucky, but died on his way, at Pittsburg, Dec. 1, 1818. He was buried there, and a handsome monument was erected to his memory by his widow. (E. L. D.)

BARN OWL. See **OWL**.

BARRACUDA, a name applied primarily in the West Indies to a large species of fish of the genus *Sphyræna* and family Sphyrænidæ, and secondarily extended to the other species of the family, and even to fishes somewhat resembling them in form or habits, though otherwise but distantly related. All the Sphyrænidæ have an oblong or elongated pike-like form, with the head conic and acutely pointed, and with a prominent lower jaw; two dorsal fins distant from each other, the first of which has five slender spines, and the second (typically) nine branched rays; the anal like and opposite the second dorsal; the caudal forked, and the ventrals originating considerably backward of the pectorals. The true barracuda (*S. picuda*) attains a length of three or four feet, and has comparatively large scales (83 along the lateral line), and the dorsal fin commences above the ventrals; it occurs on the Florida coast. Two other species extend their range much farther northward, and even sometimes to Cape Cod. The *S. guaguancho* has about 110 scales in the lateral line. The first dorsal commences in advance of the ventrals, and the pectorals extend as far back as the front of the dorsal. This fish attains a length of nearly two feet. The *S. spet* has still smaller scales (130–150 along the lateral line); the first dorsal begins slightly in front of the ventrals, and the pectorals fall short of the dorsal. This species is also an inhabitant of the Mediterranean; it sometimes grows to two feet in length. One species inhabits the Pacific northward to San Francisco—the *S. argentea*. It has very small scales (about 170 in the lateral line); the spinous dorsal commences just in front of the ventrals. This fish attains the length of two or three feet. Economically, the most important of these species are the *S. picuda*, an object of food in the West Indies, and the *S. argentea*, which is an important food-fish along the Californian coast. The *S. picuda* is one of numerous West India fishes which under certain conditions become poisonous, although generally good and savory. There are less than twenty species belonging to the family, but all tropical and temperate seas are inhabited or visited by one or more kinds. They are voracious fishes, and are sometimes designated as "sea-pike" by English-speaking peoples. (T. G.)

BARRATRY, in criminal law, is the offence of frequently fomenting vexatious and groundless litigation on the public generally or among citizens, irrespective of any private relations the offender may bear to the parties. This offence is indictable at common law, but in order to warrant conviction the proof must show at least three instances of offending. It is generally supposed that no man may be convicted of barratry for bringing any number of false actions in his own right. An attorney can never be adjudged guilty of barratry for maintaining another person in groundless actions to the commencing whereof he is in no way privy. In maritime law any fraudulent breach of duty on the part of the master of a ship or of the mariners thereof, to the injury of the owners of the ship or cargo, is called *barratry*. The term is used in the French law to include all negligent as well as fraudulent conduct, but in the English and American law gross misconduct or fraud is necessarily implied. Thus, where a master sails out of port without paying port-dues, cruises in quest of prizes without proper authority, disregards an embargo, attempts a breach of blockade, is concerned in or connives at smuggling, wilfully delays, deviates, or runs off with the ship, sells her or her cargo, or runs the ship ashore without reasonable cause, he will be held guilty of barratry.

Barratry is one of the usual marine risks, and is therefore covered by a policy of insurance which does not specifically state the perils insured against. It is customary, however, in marine policies to insert a special clause insuring against this peril. In the Scottish jurisprudence and in the civil law barratry is the crime of a judge who accepts a bribe as a reward for his judgment.

BARREL-MAKING has almost ceased to be a handicraft, by far the greatest number of operations involved in it being now performed by machinery; especially is this so in the United States. The first introduction of labor-saving machinery by American barrel manufacturers was the inciting cause of very serious strikes among the coopers, which ended in the latter part of 1873. The trade has been completely revolutionized, and machines are now used at every stage of the process,—for making and preparing the staves, the heads, the hoops, and finally for putting together these component parts into the finished product.

Manufactured barrels are divided into two classes: *tight* and *slack*. The *tight barrel* or *cask*, intended to contain liquids, is generally more substantial and requires more time, material and labor for its production than the *slack barrel*, which is intended for holding flour, sugar, lime, cement and other dry substances. The devices for making kegs and small casks may also be separately classified, as in many respects their construction differs in matters of detail from that of barrel machinery. The latest and most approved patterns of machinery of this kind are the inventions of Messrs. E. & B. Holmes of Buffalo, N. Y., who are, at the same time, the sole manufacturers of their machines.

1. *Stave Machinery.*—The principal manipulations of the stave are jointing, dressing, equalizing, and sawing. In the jointing machine, the stave is tightly held in clamps, and by pressure on a foot-treadle it is moved up to a disk on the face of which are radially disposed knives, which bevel off the edges of the stave to the proper degree for fitting it into the cylindrical barrel. With this machine a fan-blower is combined, so that all dust and shavings are removed as fast as produced. When the stave is jointed, the relaxation of pressure on the treadle causes its release. Arrangements are provided for tightly holding the work and also for giving to the edge any desired bilge or bevel. The machines employed for dressing sawed staves consist of a rotary cutting-head and a carrying or revolving bed, with feed-rollers which compel a strong forward motion. The stave is placed upon the bed and carried under the rollers, which are made either straight or convex so as to fit the shape of the work. The rotary head and cutters are so made and ground that the staves are smoothly finished and have a uniform thickness. For dressing rived and sawed staves of all thicknesses, a special machine has been devised, which dresses both sides of the stave at the same time without cutting the wood across the grain. This is accomplished by allowing the frames which support the cutters to oscillate and rock in all directions, so that the cutters adapt themselves to all the crooks and winds of the stave. For sawing staves the cylinder sawing machine is employed; this machine cuts the stave, which is suitably clamped and fed forward in circular form. In order to saw the staves to uniform lengths, the stave-equalizer is employed. The staves are placed upon a conveyor consisting of two endless ropes, by which they are brought upon the peripheries of two wheels on the same shaft, so that each stave rests across projections on the rim of the wheels. As the wheels rotate, the ends of the stave are brought in contact with two circular saws, which are adjusted at a distance apart equal to the desired length of the stave. The feed being continuous and the operation of the machine automatic, it is only necessary to place the staves on the conveyor, when they are rapidly conducted to the saw.

2. *Head Machinery.*—Barrel heads are not usually made of a single piece, but are composed of several pieces which are often jointed and dowelled together. The barrel-head jointing and boring machine is used to make the joints and prepare the pieces of heading for the dowels. It consists of a large rotating metal disk, in the face of which are fixed three cutters, equidistant from each other. In front of the disk are a standard and rest. Upon the latter the piece of rough heading is laid, and its edges are pressed against the disk by hand, thus rendering them by means of the cutters perfectly smooth and straight. The work is then removed and laid upon another rest on top of the machine, where it encounters two swiftly revolving augers or bits, which are forced against the edge by a foot-treadle, and which speedily bore the holes for the dowels, which are afterwards inserted by hand. There are no shavings visible about this machine, since the disk acts as a fan and blows them away through a shoot. The heads of a large number of barrels can thus be prepared by a single man, and the joint knives are so arranged that either a hollow or a straight joint can be made as desired. After the dowels are inserted and the separate pieces put together, forming rough squares, they are ready for the next process, levelling and facing. This is done in the barrel-head dressing machine, and consists in levelling, facing, and dressing the heads on one side. A prepared head is laid upon the table of the machine and against a planer cylinder on which are several blades. This planer is just beneath the surface of the table, and by swift rotation smooths off the under side of the heading at the rate of from 15 to 25 heads per minute. The pieces of heading are held firmly against the planer by four corrugated feed-rolls, which are driven by a belt, and counter-weighted by levers with weight attached, and the revolution of these rolls carries the headings over the planer knives, by means of which the heading is smoothed.

The next operation is turning the heads in circular form, and at the same time bevelling the edge with two bevels, the upper bevel being less than the lower one. The machine employed for the purpose is a remarkably ingenious device. It consists of two vertical disks, between which the head is placed. One of these disks is provided with spring pins near its periphery, which press the head against the opposite disk. The pin disk is not connected with the driving gear. Its spindle enters a cylindrical standard in which is placed apparatus by means of which the disk is thrown forward and locked in that position, firmly holding the work. Through the rotation of the opposite disk, the pin disk is also carried around, but for only one revolution, at the end of which a stop mechanism unlocks the clamp so that the pin disk springs back and allows the finished head to fall out. The other disk is rotated by gearing connected with the driving pulley. The saw is mounted on a separate carriage and has its own driving belt. Upon one side of the blade are secured two peculiarly arranged knives, so that when the cutting mechanism is moved up against the edge of the head by a foot-treadle, both sides are cut at once, and at the same time through its rotation the work is cut in circular form. The saw-carriage is provided with a counterpoise to bring it back into position when the treadle is released. The machine is so constructed that, with one and the same concave saw, all kinds and sizes of heads can be made. The turning of a hand-wheel quickly sets the machine to any size required, and the saw is so presented to the wood that it runs with the same freedom and smoothness and requires no more power or set than an ordinary circular saw of the same diameter. The machine has also an attachment which can be so used as to give the heads an oval form to compensate for the shrinkage of material. This completes the operation of making the heads, which are then transported to the proper place and inserted in the barrels.

3. *Hoop Machinery.*—The next device is the hoop-bending machine, for bending and giving to metal hoops the required flare, and also punching and riveting the ends together. The machine is set up in a stout cast-iron frame holding a pair of chilled-steel rolls driven by a strong driving gear on the spindle of the lower roll, and opposite to the driving gear is an eccentric cam which actuates a heavy lever. At the end of this lever farthest from the cam are two punches attached to the under side of the arm, which fit into a die-plate with corresponding holes. Below the cam-slot this side lever is squared off, and the face thus formed is provided with lugs which correspond in position with two U-shaped holders just underneath it on that side of the machine. The bending and flaring are done by passing the hoop-iron through the rolls. The ends are punched by placing them under the punches arranged at the end of the side lever. Then the ends of the hoop are brought together, and the holes in them made to coincide. The hoop is then raised and the holes slipped over the rivets previously placed in the U-shaped holders. The hoop is now brought under the lugs of the lever below the cam, which in their descent strike the rivets and close them, completing the operation and leaving the hoop ready for placing upon the barrel.

4. *Barrel Machinery*, technically so called, comprehends certain inventions which have been mainly instrumental in developing to its present dimensions this important industry. The first operation in making barrels for the Holmes process is the *setting up* of the barrels, prior to their delivery to the machinery. The setting up form is composed of two heavy circular iron plates, secured together concentrically, thus forming an annular groove and bolted to the floor; from these rise short standards which support a hoop. The staves are set in between the circular plates, and fitted carefully together. The iron truss-hoops, previously placed in proper position, are lifted up by hand so as to embrace the lower portion of the staves and hold them in place, when the whole is lifted out of the frame. One-half of the barrel is now tightly held together, but the remaining upper half is still open and flaring outward. To secure this in a similar manner, a rope is passed around the flaring ends, and by a few turns of a power windlass the staves are brought together, the truss-hoops are slipped over the extremities, and the barrel is now ready to be heated in order to cause the staves to assume a curved shape. The heaters over which this is done are simply cylindrical iron stoves, over which the barrel is set, its top being clasped with a sheet-iron cover which is let down upon it from above.

After the staves are well warmed through, the barrel is taken to the *levelling machine*. The object of this machine is to bring the barrel into such shape that when on end it will stand perpendicular and not lean in any direction. The machine is very simple, consisting of an iron frame with two large disks in a vertical position and the driving gear. The disk at the end of the frame is fixed, the one next to the driving gear movable. The barrel, with its axis in a horizontal position, is placed between the two disks, the inner faces of which are provided with projections, so as to hold the barrel in place; the driving gear is then set in motion by means of a clutch, and the movable disk is driven without blow or jar toward the fixed one, moving along in the direction of the axis of the barrel, and powerfully compressing the same. When released from this pressure the barrel is found to be perfectly levelled and true. The capacity of this levelling machine is from 300 to 400 barrels per hour.

From this, the barrel is next transferred to the *trussing machine*. This consists of a strong circular bed-plate bolted to the floor. Bolted to this bed-plate are six notched standards ranged in a circle and facing radially. Intermediate between these short standards are six openings slotted out of the bed-plate, through which protrude six hooked bars provided with sliding collars. These bars are operated by a reversible screw-gear beneath the floor and controlled by means of a lever reaching above. When the machine is started, these long arms, or hooked bars, spread apart and outward; at this moment the barrel is inserted between the short standards before mentioned, in such manner that the two lower truss-hoops rest in the notches. Then the hooked bars close, their hooked ends clutching the upper, and their sliding collars the second truss-hoops respectively, and by a strong downward pull dragging these iron rings over the more bulging part of the barrel, and of course wedging them on more tightly. The same effect is produced by the stationary short lower standards, by their simultaneously resisting the motion of the lower hoops as the barrel is pressed downward. The machine, operated by a single man, does the work of twenty.

Before the head is put in, the barrel must be *crozed* and *chamfered* at each end; that is, grooves must be cut around the inside, a short distance below the edge, for the reception of the head, and the edge itself must be bevelled after cutting off the ends of the staves to a perfectly true line. These operations when done by hand are more difficult and require more time than any other work on a barrel; and in heavy casks it is necessary to cut a *howel* or wide semicircular indentation around just below the croze. All this work is now done in the *chamfering and crozing machine*, which chamfers, howels, levels, and crozes a barrel of imperfect periphery, finishing both ends at once to a perfect circle, and turning off from 800 to 1200 barrels per day. The machine is mounted on a heavy cast-iron frame, and consists principally of two chuck-rings with cog-wheels and cutters working within them. As in the levelling machine, the end chuck is stationary, and the one next to the driving gear movable in the direction of its axis. The barrel is placed between the chuck-rings, and its ends fit into the peripheries of the cog-wheels which work within the rings. As soon as the barrel is in place, the movable chuck is brought to full bearing upon it, thus confining it. Next a clutch is thrown into gear by which a rotatory motion is imparted to the barrel, and the cutters which perform the crozing and chamfering are now brought into play. The cutters are all fastened to two circular heads, the axes of the shafts on which these are mounted being axial to the barrel. The cutters revolve up against the inner edge of the barrel, the shafts being mounted upon vibrating carriages and driven by two small belts. A single revolution performs the operation, the movable chuck is drawn back, the barrel rolled out, and thus what is—by hand labor—the work of hours is completed in a few seconds. Each cutter is controlled by a rest upon the outside, thus compelling uniform thickness and depth of chine, while the same is levelled in a perfect manner. By proper sized chucks any kind of barrel may be operated upon, and the change from one size to another is easily effected.

From this point on the barrel is finished by hand, the principal work remaining to be done being the putting on of the hoops and setting the heads in place. Barrels differ so much in shape that thus far no practicable machinery has been introduced to supersede manual labor.

To the foregoing machines has been added another, which performs the operations of levelling and trussing at once, thus combining two machines in one. In this apparatus the trussing devices are all connected with the levelling disks, and by means of handles on each of the latter are all opened at once. The barrel with the truss-hoops on is then inserted, and by pressure upon a foot-treadle the spring-bolts close simultaneously upon the truss-hoops. By means of a clutch-lever the machine is thrown into action, the two disks are forced toward each other, thus levelling the barrel, and at the same time the spring-bolts force the truss-hoops home. This machine will truss and level 2000 slack barrels of various sizes per day.

How well these machines are adapted for their purposes is shown by the fact that the Holmes process is not only the standard method of barrel-making in the United States, but has also been almost universally adopted abroad.

The importance and extent of this industry can be estimated from the fact that in 1880 the number of staves produced in the United States was 1,248,226,000, and the number of sets of headings 146,523,000. The lumber industries engaged in the production of staves and headings are distributed in the United States as follows, viz.:

States.	Staves.	Sets of Headings.
Indiana, . . .	283,071,000	26,389,000
Ohio, . . .	214,245,000	25,779,000
Michigan, . .	199,821,000	21,897,000
Wisconsin, . .	82,545,000	7,498,000
Pennsylvania, . .	80,062,000	10,401,000
New York, . .	62,654,000	22,136,000
Maine, . . .	62,376,000	3,312,000
West Virginia, . .	41,992,000	1,952,000
All other States and Territories, . .	217,460,000	27,159,000
Total, . .	1,248,226,000	146,523,000

Notwithstanding the enormous home consumption of staves, headings, and hoops, a heavy export traffic is carried on. The only competition which American cooperage lumber has to meet abroad is in the Bosnian oak for tight work, and in the Norway fir for slack work. The exportation of American cooperage lumber is steadily increasing; the value of our exports of staves and headings for the fiscal year ending June 30, 1881, amounted to $3,136,914; and for the year ending June 30, 1882, it was $4,346,878, showing an increase of $1,209,964. Manufactured barrels are not an article of export, but the demand for them at home is as steadily increasing as the demand for the material is increasing abroad. This feature of this industry is so marked that there are at present several barrel factories in the United States whose individual yearly output is equal to that of the whole United States ten years ago. That such an enormous consumption constitutes a heavy drain upon the national resources of cooperage timber is self-evident, and the rapid depletion of our forests will soon endanger one of our most important industries.

The kinds of wood chiefly employed in the manufacture of barrels are white oak and red oak for staves for tight stock, and elm and oak for staves for slack stock. Headings for the former are made of white oak and also of pine, and for the latter of basswood, white ash, and also oak. Wooden hoops are made of elm, black ash, and hickory, and are used only on slack work: for tight work iron hoops are used exclusively.

Paper Barrels.—A great deal of attention has of late been paid to the manufacture of *paper barrels*. But although there are in operation several processes by which it is endeavored to produce them, the results obtained thus far are not satisfactory. The different methods of making paper barrels are all far too expensive to admit of their more general adoption or of any possible competition with wood. They are principally used for the transportation of furs, spices, etc., and always command high prices.

Wrought-iron barrels are manufactured principally under the Dickinson patent in England. They have a cylindrical form with a soldered seam. An iron hoop is riveted to each end. This hoop has a rabbet, and the thickest part is riveted to the drum, while the other portion forms a recess with the side of the drum for the reception of the flange of the head, which is made by bending the periphery of a circular iron plate at a right angle to its plane. A packing of greased hemp bands is placed in the recess, the flange of the head driven in, and then the edge of the iron hoop is turned over against the bottom head, making an air- and water-tight joint. This is for the bottom head. The upper head can be removed without danger to the package. The upper portion of the hoop is not flattened down as at the other end of the barrel, but a number of latch-bolts are pivoted to the cover and catch into openings at the side of the hoop. The metal is coated inside and out with canvas saturated with a composition of caoutchouc, 8 parts; black resin, 4 parts; turpentine, 1 part. This composition is digested and spread on the cloth, and the latter is then run on through rollers. There are also special kinds of barrels not here described. (A. F. H.)

BARRET, Benjamin Fisk, an American Swedenborgian minister and author, was born at Dresden, Me., June 24, 1808. He graduated from Bowdoin College in 1832, and after teaching for two years entered the Divinity School at Cambridge, where he graduated in 1838. During the next year he preached for different Unitarian churches, but devoted much time to the study of the writings of Swedenborg. Becoming convinced of the truth of these revelations, he joined the "New Church" (commonly called Swedenborgian), and in 1840 became pastor of the first New Church society in New York, where his lectures attracted public attention. In 1848 he became pastor of a society in Cincinnati, but after two years his health failed and he removed to Chicago. In 1854 he took up his residence in Brooklyn, and two years later in Orange, N. Y., where he was occupied chiefly in writing on the new theology. In 1864 he became pastor of the New Church society in Philadelphia, and held this position for seven years, still continuing his literary activity. Since 1873 he has been president of the Swedenborg Publishing Association.

Mr. Barrett is one of the most voluminous writers on the doctrines, theology, and philosophy of the New Church in the United States. He has published the following volumes: *Life of Emanuel Swedenborg; Lectures on the New Dispensation; The Golden Reed, or the True Measure of a True Church; The Question of the Visible Church; Beauty for Ashes; Letters on the Divine Trinity; Catholicity of the New Church; The New View of Hell; The Golden City; Letters on the Future Life; The New Church, its Nature and Whereabout; Swedenborg and Channing.* His most important labor is the compilation known as the "Swedenborg Library," in which the substance of Swedenborg's voluminous theological writings is condensed. The work presents to general readers a clear idea of Swedenborg's teachings on every theological and ethical question.

BARRIAS, Félix-Joseph, a French artist, was born at Paris, Sept. 22, 1822. He studied under Léon Cogniet, and in 1844 took the *prix de Rome* at the École des Beaux-Arts with his picture of Cincinnatus receiving the Deputies of the Senate. Since 1847 he has been a frequent contributor to the annual Salons and to other important exhibitions. At the Philadelphia Exhibition of 1876 he was represented by his Electra, a very characteristic work, which well represents the range of his powers and the qualities of his learned and severe style. This picture, which is one of his most important performances, was painted in 1873. Barrias's pictures are mostly classical in subject, and describe incidents of Greek and Roman life and legend, as, for instance Horace, Augustus and Mæcenas, Exiles under Tiberius, A Dance of the Triclinium, and Helen placing Herself under the Protection of Vesta. Among his pictures which have other than classical themes may be mentioned Eve, "L'homme est en mer!" from Victor Hugo's *Légende des Siècles*, and an elaborate composition entitled La Picardie, on the staircase of the Museum of Amiens. The most important work of the artist is a series reciting incidents in the life of St. Généviève, in the chapel dedicated to that saint in l'Église de la Trinité at Paris. He has also executed frescoes in l'Église de St. Eustache, in the Hôtel du Louvre, and in private houses. Barrias is a man of extensive learning and is an admirable draughtsman. His color is weak, however, and his handling is lacking in freedom. (W. J. C., JR.)

BARROT, Camille-Hyacinthe-Odilon (1791–1873), a French advocate and statesman, was born at Villeport (Lozère), July 19, 1791. Soon after the restoration of the Bourbons (1815) he joined the Liberal party. He was counsel for the defence in several political trials, and gained a high reputation as an advocate. He promoted the Revolution of 1830, but opposed the establishment of a republic, preferring "a popular throne surrounded by republican institutions." The result of his mediation was the programme which gave the throne to Louis Philippe. He was elected in 1830 to the Chamber of Deputies, in which he opposed the *doctrinaires* and reactionary measures. As the head of the dynastic Left in 1836 he supported M. Thiers, the leader of the Left Centre. He was for seven years the standard-bearer of the moderate party, and secured the revision of the penal code and many improvements in public instruction. In 1847 he was the most efficient promoter of the reform banquets, and made many public speeches against the dominant party. He was, however, still devoted to a constitutional monarchy, and did not act with the republicans who overthrew Louis Philippe in 1848. On the 24th of February he was appointed prime minister, and on the abdication of the king he proclaimed the duchess of Orleans as regent, but this effort was quickly defeated. Having been elected to the Constituent Assembly of 1848, he advocated the adoption of a government with two chambers. He was appointed minister of justice by Louis Napoleon in December, 1848, with the right to act as premier. He resigned office in October, 1849, and after protesting against the *coup d'état* of December, 1851, retired to private life. In 1870 he was elected a member of the Institute, and in 1872, Pres. Thiers appointed him vice-president of the Council of State. He died at Paris Aug. 6, 1873, leaving *Memoirs* which were published (4 vols., 1876).

BARTHÉLEMY-SAINT-HILAIRE, **Jules**, a French philosopher, Orientalist, and senator, born in Paris, Aug. 19, 1805. In early life he was an active journalist and politician, but afterwards withdrew from these pursuits to devote himself to philosophy. In 1832 he began to make a complete translation of the works of Aristotle, and in 1838 was appointed professor of Greek and Latin philosophy in the Collége de France. In 1839 he was admitted into the Institute (Academy of Moral and Political Sciences). He was a Republican member of the Constituent Assembly in 1848, and of the Legislative Assembly of 1849. After protesting against Napoleon's *coup d'état* of Dec. 2, 1851, he refused to take the oath of allegiance, and resigned his chair in the college, but he was reinstated in 1862. In 1869 he was elected to the Corps Législatif from Seine-et-Oise, and on the downfall of the Empire, in Sept., 1870, he became a member of the National Assembly. In 1871, Pres. Thiers, whose intimate friend and political supporter he had been, made him his secretary, which position he retained till M. Thiers resigned in May, 1873. In December, 1875, Barthélemy-St.-Hilaire was elected a senator for life, and in September, 1880, he was made minister of foreign affairs under Pres. Grévy. Although he had been appointed on account of his known inclination for peace, yet under his administration Tunis was annexed to the French possessions. The expense and bad management of this expedition caused dissatisfaction among the people, and the minister was obliged to resign his position in November, 1881. His chief literary production is the translation of the works of Aristotle, already mentioned (17 vols., 1837–70). His study of philosophy had led him to investigate the great Oriental religions, and some of his works are devoted to these systems of belief. Among them are *Des Vedas* (1854), *Du Bouddhisme* (1855), *La Vie de Mahomet* (1863), *Mahomet et le Coran* (1865). He has also published a treatise on the *Philosophie des deux Ampères* (1866).

BARTHOLDI, **Frédéric Auguste**, a French sculptor, was born at Colmar, April 2, 1834. He began the study of art under Ary Scheffer, and appears originally to have intended to devote himself to painting. Bartholdi is the author of a great number of statues and groups, and he has executed many monumental works. The most important of the latter is the huge figure entitled Liberty Enlightening the World, which it is proposed to place on a prominent site in New York harbor. A portion of this design—the hand holding a torch—was for several years exhibited in New York City, while the design itself has been frequently reproduced in various ways, and through it the artist is chiefly known outside of France. Other of his monumental works are a fountain in honor of Martin Schoen, the painter and engraver, and a fountain surmounted by a statue of Gen. Rapp, both of which have been erected in Colmar, and a lion commemorative of the heroic defence of the city of Belfort during the Franco Prussian War. As a volunteer under Garibaldi the artist served with distinction during that war. Among the other works of Bartholdi worthy of mention are La Lyre chez les Berbères, a group in bronze; La génie dans les Griffes de la Misère, a group in plaster; Les Loisirs de la Paix, a group in plaster; Jeune vigneron alsacien, a statue in bronze; Vercingetorix, an equestrian statue; La Malédiction de l'Alsace, a bronze and marble group; Les quatre Étapes de la Vie chrétienne; and a bronze statue of La Fayette which has been erected in New York City. In addition to the above mentioned works and other statues, Bartholdi has modelled many portrait-busts. He was decorated with the cross of the Legion of Honor in 1865.

BARTHOLOMEW, **Edward Sheffield** (1822–1858), an American sculptor, was born in Colchester, Conn., in 1822. He began the study of art at the National Academy of Design in New York. Afterwards he went to Italy, and resided in Rome during the rest of his life, although he several times came to America on long visits. Bartholomew never succeeded in becoming a thoroughly fine executant, but he was a man of genuine talent, and all of his works are marked by interesting qualities. Among his most able performances are—Blind Homer led by his Daughter, Eve, Sappho, Shepherd-Boy, Genius of Painting, Youth and Old Age, Evening Star, Eve Repentant, Flora, and Washington. He died in 1858.

BARTLETT, **John Russell**, an American author, philologist, and antiquarian, was born at Providence, R. I., Oct. 23, 1805. Upon reaching manhood he engaged in mercantile pursuits, which after a few years he relinquished for the cashiership of the Globe Bank in Providence. He removed to New York in 1837, and became a partner in a mercantile firm, but soon after entered into the book-trade with Mr. Charles Welford, with whom he carried on a successful business for ten years. Mr. Bartlett devoted his leisure hours to the study of history and ethnology. In connection with the Hon. Albert Gallatin he founded the American Ethnological Society, of which he became secretary. He was also for many years secretary of the New York Historical Society. Retiring from business in 1849, he was in 1850 appointed U. S. commissioner for the survey of the boundary-line between the United States and Mexico, in pursuance of the provisions of the treaty of Guadalupe Hidalgo. With a corps of engineers and assistants of about one hundred persons, and a military escort of as many more, he traversed the vast regions of prairie and desert which lie between the Gulf of Mexico and the Pacific, as well as a large portion of Texas and New Mexico—a distance altogether of some 5000 miles. The results of this survey, which occupied three years and embraced observations in astronomy, ethnology, and natural history, were published by the U. S. Government in 1857–58. In 1855 he was elected secretary of state of Rhode Island, which office, by repeated elections, he held for seventeen years. Among his literary works are *The Progress of Ethnology* (1847); *Reminiscences of Albert Gallatin* (1849); *Dictionary of Americanisms: a Glossary of Words usually regarded as peculiar to the United States* (1848; 5th ed. 1882). He also wrote a *Personal Narrative of Explorations and Incidents connected with the Mexican Boundary Survey* (2 vols., 1853–54); *The Destruction of the British Schooner Gaspée, June 10, 1772* (1862); *Memoirs of Rhode Island Officers in the War of the Rebellion* (1867); *Primeval Man and his Associates* (1868). Mr. Bartlett's bibliographical works comprise a *Bibliography of Rhode Island* (1864), *Literature of the Rebellion* (1866), and especially his *Bibliotheca Americana: a Catalogue of Books relating to North and South America in the Library of John Carter Brown of Providence* (4 vols., 1865–82). This work is accompanied with copious annotations, facsimiles of ancient maps, portraits, and other plates. Mr. Bartlett has also compiled genealogies of the Wanton family of Newport, R. I. (1878), and of the Russell family (1875), and has edited with copious notes *The Colonial Records of Rhode Island, 1636 to 1792* (1855–65), and the *Letters of Roger Williams, 1632–82* (1874). Mr. Bartlett is most widely known by his *Dictionary of Americanisms*, a work which, though not entirely free from error, is in the main a faithful record of dialectic peculiarities in the United States.

BARTLETT, TRUEMAN H., an American sculptor. was born at Dorset, Vermont, in 1835. He commenced his studies with Robert E. Launitz in New York, and continued them in Paris and in Italy. Among his notable works are The Wounded Drummer-boy, The Angel of Life, and Wisdom. Bartlett has a son, Paul by name—born Jan., 1865, at New Haven, Conn.—who, as a boy, won the commendation of some of the best French sculptors by a bust of his grandmother. This work he exhibited at the Salon with success. He has also modelled heads of various animals and other works of promise.

BARTOL. CYRUS AUGUSTUS, D.D., was born at Freeport, Maine, April 30, 1813. He graduated at Bowdoin in 1832, and studied theology at Cambridge, Mass. In the autumn of 1835 he supplied the pulpit of the Unitarian church in Cincinnati. In 1837 he was ordained as the colleague-pastor of the West Church, Boston. His principal publications are *Christian Spirit and Life* (1850), *Christian Body and Form* (1854), *Pictures of Europe* (1856), *Church and Congregation* (1858), *Ministers of West Church, Principles and Portraits, Radical Problems* (1872), *Rising Faith* (1873).

BARTON, BENJAMIN SMITH (1766–1815), was born at Lancaster, Pa., Feb. 10. 1766; studied medicine in Philadelphia, and completed his studies in Europe, taking his degree of M.D. at Göttingen in 1778. He became professor of botany and natural history in the University of Pennsylvania. In 1795 he was appointed professor of materia medica, and afterwards succeeded to the chair of theory and practice. In 1803 he published a work on botany. Besides works on medical subjects, he published *New Views of the Indian Tribes.* He died at Philadelphia, Dec. 19, 1815.

BARTRAM, JOHN (1699–1777), a distinguished American botanist, was born in Chester co., Pa., March 23, 1699. He was a member of the Society of Friends, and a grandson of John Bartram, who accompanied William Penn to America in 1682. When young he manifested a strong desire for knowledge, and obtained some acquaintance with the ancient languages. His principal subject of study was botany, though he also acquired a good knowledge of medicine and surgery. He was one of the earliest of American botanists, and was the first to conceive the idea of forming a botanic garden for American plants. He was then engaged in the business of farming, and devoted five or six acres of his farm to the above purpose, planting the garden with his own hands. It was formed in a fine situation on the west bank of the Schuylkill, then about four miles south of Philadelphia, though now within the limits of the city. The garden, filled in time with a great variety of American and exotic plants, still remains, though in a neglected state, and contains many fine old trees. His love of botany led him on long excursions into the deep forests, which furnished him a rich and virgin field of research, and he attained such proficiency that Linnæus pronounced him "the greatest natural botanist in the world." In 1743 he undertook his first extensive botanical excursion into the American wilderness. At that period an envoy or interpreter sent on a mission to the Six Nations of Indians of New York was about to proceed to Onondago in the latter colony, and Bartram took the opportunity to join him provided with all the requirements for botanical collection. For days they travelled through the thick forests until Onondago was reached, from which point Bartram proceeded to Oswego, and partly explored the shores of Lake Ontario. He returned to Philadelphia after three months' absence with a rich store of specimens. His observations during this journey were afterwards published under the title of *Observations on the Inhabitants, Climate, Soil, etc., from Pennsylvania to Onondago, Oswego, and the Lake Ontario*, etc. (London, 1751). In 1765 he undertook another exploring expedition, from Charleston, S. C., by land to East Florida, and made a thorough exploration of the region of the St. John's River, collecting many curious plants before unknown. During this journey he made an accurate map of the river and its surroundings, which was afterwards published by the Board of Trade of England. His "Journal of Travels in East Florida" was published in *An Account of East Florida* (London, 1766). He also contributed several papers to the American Philosophical Society and to the transactions of foreign societies. Mr. Bartram was an intimate friend of Dr. Franklin and a correspondent of Sir Hans Sloane, Mr. Catesby, Dr. Hill, Peter Collinson, and other English botanists, who furnished him with books and apparatus and exchanged specimens with him. By this means the gardens of Europe were enriched with many of the flowering shrubs, plants, and trees of North America. He was made a fellow of the Royal Society and other foreign societies, and was appointed "American botanist to His Majesty George III." During his scientific labors he supported his family by farming, and built with his own hands the stone house in which he lived, quarrying, shaping, and laying the stones himself. The old mansion yet stands, a quaint and enduring specimen of early American architecture. He died Sept. 22, 1777.

BARTRAM, WILLIAM (1739–1823), an American botanist, son of John Bartram the botanist, was born at the botanic garden of the latter, near Philadelphia, Feb. 9, 1739. He lived with a merchant in Philadelphia for four years, after which he proceeded to North Carolina, where he was engaged for a few years in mercantile pursuits. He had a talent for drawing, and inherited his father's love for botany, and accompanied him in 1765 on his expedition to Florida, where he resided for some time on the St. John's River. In 1771 he returned to his father's residence near Philadelphia. In April, 1773, at the request of Dr. Fothergill, he began to investigate the natural products of the Carolinas, Georgia, and Florida. He remained there for nearly five years, and made large collections and many drawings, which he forwarded to Dr. Fothergill. An account of his journey was published in 1791 with the title of *Travels through North and South Carolina, Georgia, East and West Florida*, etc. (Philada., 1791). This work is characterized by an enthusiastic love of nature, and especially of botanical pursuits. In 1782 he was elected professor of botany in the University of Pennsylvania, but declined on account of impaired vision. In 1786 he became a member of the American Philosophical Society. Besides his botanical discoveries he prepared the most complete table of American birds before Wilson, whom he assisted in the commencement of his book. His love of botany was such that he wrote a description of a plant a few minutes before his death. He died July 22, 1823.

BARYE, ANTOINE-LOUIS (1795–1875), a French sculptor, was born at Paris, Sept. 24, 1795. He commenced the study of engraving under Fourier, and obtained considerable skill in that art. Afterwards he practised at goldsmith's work, and lastly turned his attention to sculpture. His masters after Fourier were Bosio and Gros. His first exhibit was an engraving of Milo of Crotona in 1819, which obtained an honorable mention. In 1817 and 1820 he was awarded the second prize for sculpture at the École des Beaux-Arts. He was a constant exhibitor at the Salon from 1827 until 1836, when the refusal of a number of his pieces enraged him so that for nearly fifteen years he declined to send anything to the Salon. He was very poor and the public was unappreciative. He was studious and industrious, however, and gradually he gained recognition as a most accomplished sculptor of animals. During the later years of his life his works were much sought after by connoisseurs at large prices. In 1848, Barye was appointed keeper of the plaster department of the Louvre, which position he held until 1851. In 1854 he obtained an official position in the Jardin des Plantes, that he might have ample facilities for the study of all kinds of animals, and there also conducted a sort of school which, however, did his pupils little good. Barye's sculptures are numerous, and chiefly of what may be called cabinet size. He, however, executed several monumental works, such as The Combat of the Centaurs, the Lion of the Tuileries, and the Lion of the Column of July. Barye modelled the human figure skilfully, and in such groups as the Tartar Warrior checking his Horse, African Horseman surprised by a Serpent, Indian mounted upon an Elephant crushing a Tiger, Angelica and Rogero mounted upon a Hippogriff, Theseus slaying the Minotaur, and Theseus slaying the Centaur, it is the human quite as much as the brute energy represented which challenges admiration. It is in his delineations of animals and of animal movements, however, that the genius of Barye is most emphatically revealed. His very celebrated Jaguar devouring a Ram, which is in the Luxembourg gallery, is an example of a large number of works which came from his hand. They are modelled with a remarkable combination of boldness and delicacy, and are full of the energy of life translated into bronze. During the last years of his life especially Barye would not permit a bronze to leave his atelier which was not entirely satisfactory to him. Many of the finest collections of Europe and America contain one or more specimens from the hand of this artist, while the Luxembourg has a number of his most important pieces in bronze. The Corcoran Art-Gallery in Washington, D. C., contains 114 of his bronzes. It also possesses two water-color drawings by him, while the collection of Mr. William T. Walters of Baltimore contains seven. These drawings are very interesting and very curious. Barye was awarded a medal at the Paris Exhibition of 1854. He was given the cross of the Legion of Honor in 1833, and in 1855 was made an officer. He died June 25, 1875. (W. J. C., JR.)

BASALT, or **Trap**, is a rock formerly classified among the species of minerals, because it presents to the naked eye, and even under ordinary pocket-magnifiers, a thoroughly uniform and compact appearance. Its color on a fresh surface is either grayish- or bluish-black, but exposure to the weather produces first ash-gray, and finally leather-brown, tints. The surfaces of fracture are uneven, often splintery and flat-conchoidal. Cordier showed in 1815 that the substance of basalt is not uniform. He examined the fine powder of basalt under the microscope, and recognized the same mixture of minerals which can be seen with the naked eye in dolerite. A part of the powder is strongly attracted by the magnet, being either pure or titaniferous magnetic oxide of iron.

The microscopic examination, however, is much more satisfactory when made upon thin slices of the rock, obtained by grinding with emery on a glass plate. When sufficiently thin to be transparent the slice must be placed in Canada balsam on a piece of plate glass and covered with a very thin glass or a piece of mica. A power of 50 diameters discloses then the compound character of the rock in the smallest fragments. Three different bodies appear with the utmost constancy; they are the *essential* constituents—namely, (1) white particles, generally in distinct crystalline outlines (labradorite feldspar, nephelite, leucite, noseite): either one of these is usually present in much larger quantity than the others, sometimes exclusively, and the lithologist accordingly distinguishes several varieties, as feldspathic, nephelitic, or leucitic basalt; (2) green or brownish-green grains of *pyroxene;* (3) opaque, black grains, often in triangular shape, of *magnetic or titaniferous iron oxide.* Besides these a variety of minerals are met with in basalt from different localities. Their quantity is limited, and they are designated *accidental* or *accessory* constituents. The principal one of this kind is *chrysolite* or *olivine*, usually visible to the naked eye by its greenish-yellow color and waxy lustre. The chrysolite used by jewellers is found in the sands and water-courses of regions in which basalt is a conspicuous rock. By the latter's disintegration the more resisting chrysolite grains become loose, and are washed down into the gulches by the rains—a history similar to that of nearly all our precious stones. The other accessory minerals are mostly of secondary origin; that is, they were not originally contained in the basalt, but were formed long after the latter's solidification by chemical action of the waters percolating the rock. These minerals are found filling rents or hollow spaces of the rock, and among them are some of the most attractive representants in the mineral kingdom. They are composed of the same elements—*i. e.*, silicon, aluminum, calcium, potassium, sodium, hydrogen, and oxygen—but differ in the ratio by which these elements are combined. Most of them appear crystallized in slender prisms of orthorhombic symmetry (like the beautiful natrolite, stilbite, prehnite, and Thompsonite), or rhombohedral (as chabazite), and isometric (as analcite). Noted localities for these minerals are the basaltic rocks of the Nova Scotia coast and the Jersey Heights at Bergen Point opposite New York. The iron contained in the original constituents is often found recrystallized in the form of carbonate, as the mineral siderite or chalybite. In its topographical and structural relations to other rocks the basalt holds the position of an intruder, occurring in more or less irregular masses between the sedimentary strata. The chemical and mineralogical identity of basalt with the lavas of now active volcanoes leaves very little doubt that this rock is of volcanic origin. Wherever we find basalt we may safely presume that a volcano existed in past geological periods, not always very remote. Few rocks have been subject to so much controversy as the basalt; and indeed our knowledge of it is even now incomplete. The chief point of contention has been the water which all carefully-made analyses have shown to be present in the rock after it had been thoroughly dried at steam-heat. The quantity of this water varies from a few tenths of 1 per cent. to several per cent. If this water were originally in the rock, then it could not have been in a fiery liquid state of lava, and basalt could not be looked upon as a volcanic rock. The other side contends that the water was simply contained in the secondary silicates which came from subsequent alteration. Now, this cannot be proven either mineralogically or chemically; but the logic of inference is altogether this way, for no specimens of basalt can be collected from such depths as might be claimed with any degree of reason to have been beyond the reach of percolating water. But, granting the water to be present from the beginning, there is no reason to doubt the volcanic origin of the rock, for even a rough examination of the volcano in action shows that immense quantities of water rise from the crater in the form of steam, intimately mixed up with the molten rock. The force of cohesion is strong enough to resist the expansion of steam, which must condense upon cooling and begin its work of hydration at once.

The typical basalts are not older than the Cretaceous or Chalk formation, yet the massiest outpourings of fiery basalt occurred during the long-continued Tertiary periods following upon the Cretaceous, when mammalian animals of huge size became a characteristic feature of life upon the earth. In North America there are many basaltic regions, notably within the line of the Rocky Mountains and the Sierra Nevada. One of the most noticeable modes of occurrence is that in extended horizontal sheets, covering sandstones, shales, and clay beds. In New Mexico and Arizona the "mesas" or table-mountains owe their shape to such a cover of basalt, whose black walls form a crowning of the steep mountain-slope, shining in variegated colors. Sometimes one mountain will show several successive beds of basalt separated by sedimentary strata. Here and there the mountain-carving agencies have produced a series of retreating steps or terraces not unlike a giant's stairway. Hence the Scandinavian word "trapp," meaning a stair, is a generic name for the rocks of this basaltic family. In California the basalt often forms the bottom rock of the gold-bearing gravel, directly upon which the largest nuggets of gold are found. The basalt in this region frequently fills ancient river-channels, evidences of whose past existence are found deep under the beds of the present rivers.

Most striking to the popular imagination is the columnar cleavage of basaltic rocks. The columns are usually six-sided, and are often so regular that naturalists even have likened them to crystals. They are, however, by no means true crystals. The columns are simply the result of impeded contraction or shrinkage. When pools dry out the mud is seen to crack in all directions, forming a complete network of fissures. Inspection will show the meshes of this net to be six-sided for the largest part. The cause of this is that a hexagon is the only possible figure which can result from the combined action of a contracting force acting in all directions in one plane. The Giant's Causeway in Ireland and the Palisades on the Hudson are noted examples of this columnar structure.

Basaltic rocks produce by disintegration an excellent subsoil, bringing forth luxuriant vegetation. (G. A. K.)

BASCOM, HENRY BIDLEMAN, D. D., LL.D. (1796–1850), an American bishop of the Methodist Episcopal Church, South, was born at Hancock, N. Y., May 27, 1796. He united with the Methodist Episcopal Church in Pennsylvania in 1811, and was licensed to preach by the Ohio annual conference in 1813. He became a popular pulpit orator, and in 1823, through the influence of Henry Clay, was elected chaplain to Congress. In 1827 he was elected president of Madison College, Uniontown, Pa.; in 1829 he became agent of the American Colonization Society. In 1832 he was elected professor of moral science in Augusta College, Ky., and in 1842 was chosen president of Transylvania University. He was a delegate to the General Conference of his Church at every session from 1828 to 1844. At the division of the Methodist Episcopal Church (May, 1844) Dr. Bascom went with the Southern delegates, and wrote the protest submitted by the minority. He also prepared the report on organization at the formation of the Methodist Episcopal Church, South, by the convention in Louisville, Ky., May, 1845. At the General Conference of 1846 he was elected editor of the *Southern Quarterly Review*, which he conducted till 1850, when he was elected a bishop. He died at Louisville, Ky., Sept. 8, 1850. His most important published works are—*Sermons from the Pulpit* (1849); *The Cross of Christ* (1851); *Lectures on Infidelity* (1855); *Lectures and Essays on Moral and Mental Science, Natural Theology, etc.* (1855); *Sermons and Sketches* (1856). *A Life of Bascom*, by M. M. Henkle, D. D., was published at Nashville, Tenn., in 1854.

BASCOM, JOHN, an American writer on philosophy and social science, was born in Geneva, N. Y., May 1, 1827. He prepared for college at Homer Academy, and graduated at Williams College in 1849. In 1852 he was appointed tutor at Williams. In 1855 he graduated at Andover Theological Seminary, and the same year he was recalled to Williams College as professor of rhetoric. This position he filled until 1874, when he accepted the presidency of the University of Wisconsin, which post he still holds, and also its professorship of mental and moral philosophy. The degree of LL.D. was conferred on him by Amherst College in 1873, and that of D. D. by Iowa College in 1875. He has been a successful teacher and a large contributor to the press, more especially to quarterlies. He is a realist and intuitionalist in philosophy, a liberal in religion, and a reformer in social questions. The following works have been published by him: *Political Economy* (1859); *Æsthetics* (1862); *Philosophy of Rhetoric* (1865); *The Principles of Psychology* (1869); *Science, Philosophy, and Religion* (1871); *Philosophy of English Literature* (1874); *A Philosophy of Religion* (1876); *Comparative Psychology* (1878); *Ethics* (1879); *Natural Theology* (1880); *Science of Mind*, based on principles of psychology (1881). He has in preparation two works —*The Words of Christ* and *Problems in Philosophy*. Mr. Bascom is a thorough student and a forcible writer. All his works are important, and especially those in philosophy. (R. B. A.)

BASTARD. Under the laws of the United States the English common law is generally followed, but in most of the States the rules are so far relaxed that a subsequent marriage of the parents legitimates the child.

See Vol. III, p. 368 Am. ed. (p. 426 Edin. ed.).

A bastard is entitled to support from its father—when ascertained—as well as its mother, but apart from this has few of the rights which grow out of the relation of parent and child. The father is, however, liable on an implied contract for its maintenance when he has adopted it, exactly as he is in the case of his legitimate children, but otherwise he is not so liable for its support in the absence of an express contract, unless he has been proceeded against by the authority of the State and had an order of support made against him. The civil law said of bastards, *Patrem habere non intelliguntur*, and the common law regarded them as *nullius filii;* hence they had no inheritable blood, and could take nothing by descent from or through either parent. This disqualification did not extend in the line of their descendants in the direct line, who could inherit from them, but they could have no heir but of their own body. This severity also has been largely mitigated by statute in America, and in many of the States it is enacted that bastards shall have the right of inheritance from their mother. It has been a mooted question, and is still involved in much uncertainty, as to what system of law shall guide in determining the question whether or not a child is a bastard when the marriage has been solemnized in, or subject to the laws of, one place, and the rights claimed accrued or have to be enforced in another place. The subject belongs more particularly to the law of marriage, but it may be here stated generally that the law has been held to be that, so far as concerns personal property, a marriage which is valid in the place where celebrated will be recognized as valid everywhere else. This has been so held even where the parties left one jurisdiction in which their marriage would have been unlawful and removed to another where their marriage was lawful, for the express purpose of avoiding the prohibition in the first jurisdiction; but it was hinted that such might not be the law in a gross case, such as an incestuous marriage. The soundness of this general principle has been doubted, and it has been held on the other hand—and such seems to be the sounder and better principle—that, though the *lex loci contractus* is to fix the forms of the marriage, yet the *lex domicilii* must decide as to the essentials of the contract; as, *e. g.*, the competency of the parties to enter into the relation. As regards real estate, the law is that the child, in order to be able to take, must be legitimate by the law of the place where the real estate lies as well as by the law of the domicile.

BASTIAN, HENRY CHARLTON, F. R. S., an English physician, was born at Truro, April 26, 1837, and graduated at London University. He was assistant curator in anatomy and pathology in the museum of that institution from 1860 to 1863, and assistant medical officer of Broadmoor criminal lunatic asylum from 1864 to 1866.

In 1867 he became professor of pathological anatomy in the University College, in 1868 assistant physician in the hospital for paralytics and epileptics, and in 1871 professor of pathological anatomy in University College. He is a fellow of the Royal Society, of the Linnæan Society, and of several other scientific institutions. Dr. Bastian early gained a brilliant reputation as a pathologist, and is a noted advocate of the doctrine of spontaneous generation of living organisms, concerning which he has published several works. Among his writings are—*The Modes of Origin of Lowest Organisms* (1871), *The Beginnings of Life* (1872), *Evolution and the Origin of Life* (1874), *Clinical Lectures on the Common Forms of Paralysis* (1875), *The Brain as an Organ of Mind* (1880), and numerous memoirs in medical journals.

BASTIDE, Jules (1800–1879), a French editor and politician, was born in Paris, Nov. 22, 1800. He was educated at the Lyceum of Henry IV., and became a merchant. He opposed the restoration of the Bourbons, and continued throughout his life a liberal Republican, though in religion a firm Catholic. In the reconstruction of the National Guard after the Revolution of 1830 he was made commander of the legion of artillery, which was composed of republicans. In 1832 he was arrested on account of an attempted insurrection at Grenoble, but was acquitted by the jury. Having taken part in an outbreak at Paris in June of the same year, he was condemned to death, but escaped from prison and lived for two years in London. In 1834 he returned to Paris, was tried, and acquitted. Two years later he became editor of the *National*, but after ten years of service left it in 1846. In the next year he became editor of the *Revue nationale*, the organ of the Catholic republicans. On the establishment of the Republic of 1848 he was appointed general secretary of the minister of foreign affairs, and afterwards succeeded to the position of minister. He was elected to the National Assembly, and remained in the ministry till the removal of Gen. Cavaignac from the presidency, Dec. 2, 1851. Henceforth he remained in private life, though he was a candidate for the Assembly in 1857, and during the siege of Paris in 1870 was a member of the commission of the barricades. He was one of the editors of the *Revue de Paris*. He died at Paris, March 1, 1879. Besides his editorial labors, M. Bastide was the author of an essay *De l'Education publique en France* (1847). He assisted in preparing the second edition of Buchez's *Histoire parlementaire de la Révolution Française* (5 vols. 1845–47), and issued one volume of a *Histoire de l'Assemblée législative* (1847). He also published in 1858 *La République française et l'Italie en 1848* and *Guerres de Religion en France* (1859).

BASTIEN-LEPAGE, Jules, a French painter, was born at Damvillers, Nov. 1, 1848. He studied under Cabanel, and exhibited at the Paris Salon in 1874 a Song of Spring and a portrait of Mon Grandpère, for which he obtained medals. His other works are The Communicant, Les Foins, Mes Parents, Joan of Arc. Lepage's great merit is in the intensity with which he is able to present the essence of his subject. Though there is a certain lowness about his style which resembles the method known as "impressionist," yet he is in fact a subjective painter of high rank, despite his peculiarities and what may be called his eccentricities. In his great picture of Joan of Arc the chief point is not his making the heroine a genuine peasant-girl, but the force with which the theme as a whole is presented. The rapt expression of the girl would make this picture notable whatever her garb might be.

BATAVIA, a village in Kane co., Ill., on both sides of Fox River, 32 miles W. of Chicago, with which it is connected by branches of the Chicago, Burlington, and Quincy Railroad and of the Chicago and Northwestern Railroad. It has two hotels, a music-hall, a national bank, a weekly newspaper, a private insane asylum, eight churches, two fine school-buildings, and a public library. It has a large wind-engine and pump factory, paper-mill, wagon-factory, cheese-factory, a foundry, and several minor industries, besides large stone-quarries in the vicinity. The aggregate capital employed in manufactures is $1,250,000, and the annual products are estimated at $2,300,000. The town was laid out in 1837. Population, 2639.

BATAVIA, the county-seat of Genesee co., N. Y., is on Tonawanda Creek, 36 miles east of Buffalo on the New York Central Railroad. From it branches of this road run to Canandaigua and Tonawanda, and it is connected with the Erie Railroad by the Attica branch. It has a court-house, two national banks, a savings bank, three weekly newspapers, seven churches, a union school with a fine building, ladies' seminary, public library, and the State institution for the blind, founded in 1868. Its manufactures comprise steam-engines, thrashing-machines, agricultural implements, sash and blinds. It is handsomely laid out with wide, well-shaded streets. It is one of the oldest towns in Western New York. Population, 4845.

BATES, Samuel Penniman, LL.D., a Pennsylvania historian, was born at Mendon, Mass., Jan. 29, 1827. He graduated at Brown University in 1851. In 1853 he was appointed principal of Meadville Academy, Pa., and in 1857 he was chosen superintendent of schools in Crawford county. In 1860 he was appointed deputy State superintendent of common schools in Pennsylvania. In 1865 he received the degree of LL.D. from Westminster College, Pa., and in the same year was elected by the Pennsylvania legislature State historian. While engaged in his educational labors he published *Institute Lectures* (1859); *Method of Teachers' Institutes* (1860); *Liberal Education* (1864.) He also prepared and published in the *Pennsylvania School Journal* a "History of the Colleges of Pennsylvania," and edited the *School Laws of Pennsylvania*. He afterwards published the *History of the Pennsylvania Volunteers*, in five large volumes (1866–73). He also prepared the *Lives of the Governors of Pennsylvania* (1873), which was published under the name of Major Armor, who had collected some of the materials towards it. His later works are *Martial Deeds of Pennsylvania* (1877); *Battle of Gettysburg* (1878); *Life of Gen. O. B. Knowles* (1878); *Battle of Chancellorsville* (1882).

BATH, the county-seat of Steuben co., N. Y., is on Cohocton Creek and on the New York, Lackawanna, and Western Railroad and the Rochester division of the Erie Railroad, 74 miles S. of Rochester. It contains a court-house and jail, an orphan asylum, the New York State soldiers' home, a national bank, two State banks, five churches, a union school, two weekly newspapers, two foundries, two carriage-factories, and a sash-and-blind factory. It is the centre of a rich agricultural and wool-producing country, and a narrow gauge railroad 8 miles long connects it with Hammondsport. Bath was settled in 1796. Population, 3183.

BATTLE CREEK, a city of Calhoun co., Mich., is on the Kalamazoo River, at the mouth of Battle Creek. It is 120 miles W. of Detroit, on the Michigan Central Railroad. It is also on the Chicago and Grand Trunk Railway, 163 miles E. of Chicago. A third railroad, the Toledo and West Michigan, is in construction. It has a national bank, two other banks, six hotels, two daily and six weekly newspapers, nine churches, and six schools, the central school-building being very fine. Battle Creek College is under the control of the Seventh-Day Adventists, who are very numerous in this vicinity. There is also a large sanitarium and health home. The industrial works comprise the car-shops of the Grand Trunk Railway, three thrashing machine shops, three knitting-factories, a school-furniture factory, a road-engine factory, three printing establishments, and four flour-mills. The city is lighted with gas, and has two parks. It was settled in 1840, and was incorporated as a village in 1850 and as a city in 1859. Its property is valued at $6,500,000; its public debt is $115,000, and its yearly expenses $20,000. Population, 7063.

BATTLE, WAGER OF. The *judicium Dei*, or judgment of God (also sometimes designated as *lex apparens*), in which justice was administered by the sword under an appeal to the Divine Power, is not to be confounded with the ordinary duel. Though both unquestionably spring from the passions shared by man with brutes, yet the distinction between them can be traced to prehistoric times, and the modern duello is simply a relic of feudalism, with its right of private warfare derived from the right of private vengeance common to all the barbarian tribes which overthrew the Roman Empire.

The judicial duel, on the other hand, was a mode of settling lawsuits under forms strictly regulated by legislation and conducted under the supervision of the courts which decreed it. Although traces of its existence are to be found among the old Japanese, it may be considered as virtually an Aryan custom, unknown to the Semitic and Turanian families of mankind. Among Aryans, moreover, the Oriental branches must have abandoned it at an early period, for no evidence of its existence is to be found in the primitive records of their legislation. Yet its prevalence throughout all the Aryan races who successively occupied Europe shows that its origin is to be sought in the prehistoric period before the dispersion.

It is true that it was not recognized by either Greek or Roman civilization, but the combat between Menelaus and Paris described in the *Iliad* (iii. 276–323) has all the elements of a judicial duel held under the auspices of Heaven, and shows that the ordeal of battle, like the other ordeals, was familiar to the primitive Hellenes. Livy describes it as in use among the Celts of Spain, and it formed part of the judicial system of the Irish before their conversion, though Roman civilization doubtless extinguished it among Britons and Gauls. It was of universal use throughout all the Teutonic tribes. Goths, Burgundians, Franks, Lombards, Saxons, Baioarii, Angles, Thuringians, Allemans, Frisians, Jutes, and Norsemen, all made it a more or less prominent feature of their jurisprudence, though the Anglo-Saxons appear to have abandoned it after their occupation of Briton, until it was revived by the Norman conquest. It was equally prevalent among the Slavs, and the earliest records of Bohemia, Poland, Servia, Silesia, Moravia, Pomerania, Lithuania, and Russia give evidence of its existence. With the conversion of the barbarians to Christianity the appeal was transferred from the heathen deities to the God of battles; the Church accepted the responsibility, as it did that of so many other pagan customs; and the confidence felt in this mode of determining judicial questions was rather increased than diminished. The frequent perpetration under it of manifest injustice was explained by the suggestion that the defeated party deserved his fate in consequence of other wrong-doing; and this theory received the sanction of no less an authority than Innocent III. in 1212.

The judicial duel was not restricted to either civil or criminal cases, nor to those in which defective testimony prevented a decision on the evidence. Among the Norsemen a man was entitled to lay claim to any piece of property which he might covet, and to decide its possession by the *holm-gang* or duel. Although this crude development of the law of the strongest did not obtain among the more civilized races, yet the result was practically almost the same, for the pleader had the unlimited right to challenge any witness and compel him to substantiate his testimony in the field, where the result of the combat decided the original case. Witnesses therefore appeared in court armed, and no evidence was receivable except from those able to bear arms. Even a judgment could be reversed in the same way by challenging the judge, who was obliged to vindicate with the sword the legality and integrity of his decision. With the exception, therefore, of a trifling minimum limit of value in civil cases expressed in some codes, there was practically little restriction on the judicial duel at the pleasure of either litigant. There was no exemption by reason of physical incapacity or professional incongruity, for the cripple, the minor, the woman, and the Church could appear by champion. Up to the fourteenth century even ecclesiastics were frequently forced to abide the chances of the ordeal; and indeed the Church was obliged repeatedly to prohibit them from personally sustaining their own quarrels and from adjudging the duel in their judicial capacity; while in Germany provision was made for the appearance of women in the lists, the man being buried to the waist and furnished with a mace, while the woman was armed with a heavy stone securely fastened in a piece of stuff.

No rank was so degraded as to be exempt from the ordeal, which could be decreed between two serfs. Even Jews were subjected to it, and they doubtless paid Philippe-le-Long roundly in 1317 when he relieved them from liability to it except in cases of flagrant murder. No rank, on the other hand, was so exalted as to be able to claim exemption when there was any approach to equality between the parties; and even kings not infrequently appealed to this ordeal, though it was not difficult for them to find means of avoiding the actual issue. In the seventh century, Gundeberga, queen of the Lombard Ariovald, was relieved of a charge of adultery by the victory of her champion, Pitto, over her disappointed lover, Adalulf; and in the tenth century Otho the Great forced his daughter Liutgard to defend herself in the same manner against a similar accusation. In 948, at the synod of Ingelsheim, Louis d'Outremer offered battle to Hugues-le-Grand to substantiate his complaints against the house of Capet. When, in 1002, Henry the Lame was elected emperor of Germany, Hermann of Suabia, one of his disappointed competitors, proposed to settle the matter by combat, but did not appear at the appointed place. In 1053 the emperor Henry III. challenged Henry I. of France; and not long afterwards Henry IV. offered battle to Duke Reginger to disprove an accusation of complicity in an attempt to assassinate his rival, Rudolph of Suabia. After the Sicilian Vespers, Charles of Anjou accused Pedro I. of Aragon of treachery, and a duel was arranged between them to determine the question. Even as late as the sixteenth century Francis I. challenged Charles V. as the easiest mode of disposing of the accusation arising from his violation of the treaty of Madrid; and at a later period Charles V. offered to substantiate his complaints against Francis in the same manner. The highest interests of the state were thus, in theory at least, subject to the arbitrament of the duel. When, in 968, Bishop Liutprand of Cremona was sent to Constantinople by Otho the Great to seek the hand of Theophania for his son, Otho II., the negotiations were varied by an offer made by the bishop to decide a disputed point by the sword of one of his attendants; and when, in 1177, certain conflicting claims of Castile and Navarre were submitted to Henry II. of England for adjudication, both embassies to the Angevin court were provided with champions, as well as lawyers, to be ready in case the matter were referred to the battle-ordeal. The Champion of England, who figures in the coronation ceremonies of Westminster Abbey, proclaiming his readiness to do battle with any challenger of the right of the new monarch, is thus merely an instance of the survival of a mediæval custom.

Even legislative functions were occasionally attributed to the duel. Otho the Great caused a disputed point as to representation in the succession of estates to be decided by a combat between champions, thus settling the law in a manner that has endured to the present time; and in 1180, Frederic Barbarossa employed the same means to determine the question whether he could legally summon any prince of the empire to trial at any place within its limits, the object of the decision being to break the overgrown power of Henry the Lion. Even more eccentric was the recourse to the same means in 1077 to decide whether Castile should continue to use the Gothic liturgy or should adopt the Roman ritual, as demanded by Gregory VII., when the champion of the national rite was victorious.

The employment of champions was by no means restricted to cases of this kind, or to those in which litigants were incapacitated from personal defence of their quarrel. In some of the earliest barbarian codes it seems indeed to be almost taken for granted that all duels were fought vicariously. The origin of this is probably to be sought in the solidarity of the family or sept, each member of which was responsible for every other member, thus leading to the selection of the most vigorous warrior in all cases where the common interest was thus involved. The extension of the custom in the Middle Ages is, however, plainly attributable to the practice of challenging witnesses, so that a litigant could at any time hire a bravo whose evidence could only be got rid of by the duel. This is shown not only by the occasional attempts to prevent such devices, but also by regulations existing in many places whereby the champion was forced to swear to his belief in the justice of the cause which he defended, or even to take the formal position of a witness. At the same time, we meet with enactments providing for the payment of champions, whose services as professional fighters were thus legally recognized; and, indeed, in some places provision was made for supplying them at the public expense to those who were too poor to hire them. The result of these apparent incompatibilities was that the professional champion was treated by the law with the utmost contempt as an outcast from society, and at the same time was liable to the punishment for perjury in case of defeat—this latter injustice being shrewdly defended on the ground that otherwise he might be secretly bought over by the opposing party. Inconsistent as is all this with the theory of the appeal to the judgment of God, such inconsistencies are too frequent in human institutions to call for any special wonder.

The same view of the nature of the combat as an appeal to God rendered defeat in the judicial duel a more serious matter to the litigant than the simple loss of a suit. As a preliminary, both parties were obliged to take a solemn oath, administered by a priest, usually on relics, as to the justice of their cause; and thus defeat became a conviction of perjury and an offence to the majesty of the Deity invoked. Though custom varied at different times and at different places, yet, for the most part, in criminal cases the *lex talionis* was applied, and the accuser, if he lost the battle, was visited with the punishment of the crime alleged against the accused. It thus became the rule in many countries that both could not leave the lists alive, in token of which two biers were frequently placed in the arena in readiness for each of the combatants; or, if champions were employed, the principals were held in prison with cords around their necks, waiting for the result which was to determine which of them was to be hanged. If one of them were a woman, with the peculiar cruelty visited on the weaker sex by the age of chivalry, she was buried alive or burnt.

As the duel was strictly a matter of law, no one was allowed to withdraw from it when once decreed without some penalty greater than the mere loss of his suit. He had to furnish bail for his appearance, and in case of his default these penalties were inflicted on the security. They varied in severity under different codes, being usually a fine of greater or less amount, though in Flanders the defaulting combatant suffered banishment and confiscation.

Custom varied considerably as to the arms allowed in these combats, though, as a rule, perfect equality between the adversaries was enjoined. Champions were usually restricted to the club and buckler. When the principals appeared personally, in earlier times the choice of weapons lay with the appellant, but when legislation, in the thirteenth century, commenced to discourage the wager of battle, attempts were made to transfer this advantage to the defendant.

Curiously enough, the earliest prohibition of the judicial duel is to be found among the Norsemen at the commencement of the eleventh century, coeval with, or even before, their conversion to Christianity; and their example was soon followed by the Danes, when Harold the Simple, who ascended the throne in 1074, ordered the substitution of the compurgatorial oath for all other forms of defence. The more civilized races of Europe, however, were not disposed to imitate them. It is true that protests against the custom had from time to time been uttered. As early as 643, Rotharis, king of the Lombards, had sought to limit its use while expressing his contempt for it; and in the next century King Liutprand put on record his regret that the prejudices of his subjects prevented him from suppressing it altogether. The Church, moreover, as a rule, opposed it. In the sixth century Avitus, bishop of Vienne, denounced the favor shown to it in the Burgundian laws of King Gundobald; and in the ninth century St. Agobard of Lyons wrote a couple of treatises directed against all ordeals, and that of battle especially. Numerous popes and councils took occasion to protest against it and forbid it. Even when the papal power culminated in Innocent III., however, and he repeated these prohibitions in the great Council of Lateran in 1215, he was powerless to overcome popular beliefs, and even to prevent ecclesiastics from continuing to decree the duel in their extensive temporal jurisdictions. Still, the persistent attitude of hostility maintained by the authorities of the Church cannot but have had influence in gradually moulding public opinion.

A more practical result was achieved by the rise of the Third Estate. The rapid progress of civilization in the cities rendered the burgher population for the most part averse to this mode of settling lawsuits; and the charters granted to communes throughout France, Germany, and Italy from the eleventh century onward show an increasing tendency to regard the limitation or abrogation of the duel as a special favor. Perhaps the earliest instance of entire freedom from it occurs in the charter granted to Ypres by Baldwin IV. of Flanders in 1116; but it is not until 1304, in the *keure* granted to Bruges, that we find an absolute prohibition of the duel, with a fine for offering or accepting the wager of battle. That exemption from it was in fact regarded as a privilege by the trading class is shown in the grant of such exemption by William Clito in 1127 to the merchants of St. Omer trading in the markets of Flanders; in the immunity extended by Frederic Barbarossa in 1173 to the traders of Flanders who should visit the markets of Duisburg and Aix-la-Chapelle; and in the treaty which Mtislas Davidovich made with the Hanse Towns in 1228, when he exempted from the ordeals of red-hot iron and battle the German merchants who might seek his dominions. That the duel found no place in maritime law is partly to be explained by these tendencies, and partly by the close derivation of the maritime codes from the Rhodian laws.

Yet the most efficacious agent in the eradication of the judicial duel was the influence of the Roman law, which extended itself so rapidly throughout continental Europe in the thirteenth century, undermining everywhere the institutions of feudalism, and establishing the monarch as the supreme fountain of justice. The earliest expression of the new ideas, as directed against the wager of battle, is to be found in the "Sicilian Constitutions" of the emperor Frederic II., issued about 1230, where he ridicules it as a means of ascertaining truth, and so limits its use as practically almost to abolish it. The *Kayser-Recht*, or Imperial German code, which is a little later in date, assumes in general the same position, though there is evidently less ability to restrict the custom; and the Sachsenspiegel and Schwabenspiegel, or municipal laws of Northern and Southern Germany, continued in force till long afterwards, with ample provisions for its use; but it may be assumed to have virtually disappeared with the adoption in 1532 of the criminal code known as the "Caroline Constitutions." In Aragon, in 1248, we find Don Jayme I. prohibiting it in Majorca; and in the code known as

Las Siete Partidas, issued about 1260 by Alfonso the Wise of Castile, the restrictions placed upon the "lid," or judicial duel, were such as to render it thenceforth an unimportant feature in Spanish jurisprudence. In France, St. Louis, who did so much by peaceful means to break the power of his feudatories, and who took full advantage of the theories of the Roman law to extend the authority of his central court, the Parlement of Paris, evidently regarded the abrogation of the judicial duel as one of the most efficient means of weakening the seignorial jurisdictions. By his ordinance of 1260 he virtually interdicted it throughout the domains of the Crown; and, with the rapid growth of the royal jurisdiction, his grandson, Philippe-le-Bel, was able to bring it under control throughout the kingdom, though his varying legislation shows that his efforts met with persistent opposition on the part of his nobles, who correctly looked upon it as a critical test of their feudal rights. On the accession of his son, Louis-le-Hutin, a strong effort was made to wrest the prerogative from the Crown, but it failed; and though the duel still legally existed, the Parlement almost always found excuses for denying it in practice. Occasional cases of its employment, however, continued to occur, until, in 1547, the celebrated combat between Jarnac and La Chastaigneraye led Henry II. to swear that he would never authorize another. No formal abrogation of the custom was enacted, but only one other judicial duel is on record in France, occurring in 1549, although the illegal practice of duelling continued to flourish among gentlemen to an enormous extent, in spite of numerous successive edicts of repression, Henry IV. having granted in twenty-two years no less than seven thousand letters of pardon for infractions of the law.

Notwithstanding the commercial spirit which rendered mediæval Flanders anxious to get rid of the duel, when, in 1563, the Council of Trent stigmatized it as a work of the devil, and prohibited all potentates from granting it under pain of excommunication and forfeiture of all feudal possessions, this canon was one of those objected to by the state council of Flanders when considering the question of the reception of the Council of Trent; and it was decided that the sovereign ought not to be deprived of the right of ordering the combat. Among the Slavs, the Poles abolished it in the fourteenth century; in Russia it was not abrogated until 1649, in the code issued by the czar Alexis Mickhailovich; and among the southern Slavs, according to Macieiowsky, it has been preserved to modern times.

It will be seen that throughout Western and Central Europe the influence of the Roman law gradually led the granting of the judicial combat to be regarded as an attribute reserved to the sovereign. Special enactments for its disuse, therefore, were unnecessary, and it simply became obsolete as monarchs grew too enlightened to enjoin it. In England, however, the resolute rejection of the Roman law, and consequent escape from the overshadowing power of the Crown, led to the retention of ancient customs, under the name of the common law, which the reverence for precedent hesitated to modify. As late as 1599 the act 41 Eliz. c. 3 was passed to regulate the questions which arose when several persons put forward the appeal of battle against one. The last civil suit in which it was claimed was that of Claxton *vs.* Lilburn, which induced Parliament, in 1641, to order a bill brought in to abolish it, but the reform was lost sight of in the excitement of the Civil War, and towards the close of the century Chief-Justice Hale, though able to speak of the duel as "an unusual trial at this day," still felt obliged, in his *Pleas of the Crown*, to enter into minute details as to its use in criminal cases. The softening of manners, however, naturally led to its practical abandonment, and in the absence of instances attracting public attention the law remained unaltered until 1818, when the case of Ashford *vs.* Thornton caused considerable excitement. A girl named Ashford was murdered in a manner peculiarly atrocious, and circumstantial evidence pointed strongly to Thornton as the murderer. He was acquitted on a jury-trial, and her brother, as next of kin, brought an "appeal of death" against him. In this curious relic of the older law the defendant was entitled to wage his battle, and consequently Thornton pleaded "Not guilty, and I am ready to defend the same by my body." The bench was obliged unanimously to admit this as "the usual and constitutional mode of trial," when the appellant withdrew and the defendant was discharged. A similar case occurred in Ireland almost simultaneously; and the next year this last remnant of prehistoric jurisprudence was abolished by 59 Geo. III. c. 46.

In the United States there is a tradition that a disputed question as to the boundary between two townships in New Hampshire was once settled by a combat between champions. Be this as it may, the appeal of death formed part of the common law which the colonies inherited from the mother-country. Chancellor Kilty of Maryland in 1811 considered that it was still legally existent in that State, and in 1837, Dr. Cooper, in the *Statutes at Large of South Carolina*, seemed to regard both the appeal of death and wager of battle as yet in force. Such speculations, however, are of course mere matters of legal bric-à-brac, and of no practical application at the present day. (H. C. L.)

BAUDRILLART, Henri-Joseph-Léon, a French economist, was born at Paris, Nov. 28, 1821, and educated at the Bourbon College, where he took the prize in philosophy in 1841. He obtained a mention from the French Academy in 1844, and received from the Academy in 1846 and 1850 prizes of eloquence for the *Discours sur Voltaire*, the *Éloge de Turgot*, and the *Éloge de Mme. de Staël*. For the work entitled *Jean Bodin et son Temps* he gained in 1853 the first of the Montyon prizes. In 1855 he replaced Garnier as editor-in-chief of the *Journal des Économistes*. In 1866 he took the new chair of the history of political economy in the College of France, in which he had long filled a minor position. In 1868 he became chief editor of the *Constitutionnel*, which post he held till April, 1869. In November, 1870, he was appointed general inspector of libraries, and presented in 1871 a report upon the *Pertes éprouvées par les Bibliothèques publiques de Paris pendant le Siège et la Commune.* M. Baudrillart is a member of the French Institute (Academy of Moral and Political Sciences). In addition to the works named he has published—*Manuel d'Économie politique* (1857), which obtained the following year the Montyon prize; *Études de Philosophie morale et d'Économie politique* (1860), which obtained in 1861 from the Academy a medal of 2500 francs; *Publicistes modernes* (1862); *La Liberté du Travail, l'Association et la Democratie* (1865); *Éléments d'Économie rurale, industrielle et commerciale* (1867); *La Famille et l'Éducation en France dans leurs Rapports avec l'État de la Société* (1874); *Histoire du Luxe privé et public depuis l'Antiquité jusqu'à nos Jours* (1878); and numerous pamphlets, reports, and papers on various topics of politics, literature, and philosophy.

BAUDRY, Paul Jacques Aimé, a French artist, was born at La Roche sur Yon, Nov. 7, 1828. He began his studies in his native place under Sartoris, and as his early essays were thought to make great promise, he was sent to Paris at the expense of the municipality. In Paris he studied under Drolling, and in 1850 he gained the *prix de Rome*. Baudry has travelled much, has visited Italy, Greece, and Egypt, and has painted an immense number of compositions and many portraits. Among his pictures of particular merit may be mentioned St. John the Baptist, Fortune and a Child, The Execution of a Vestal, Leda, The Pearl and the Wave (an interpretation of a Persian legend), and Charlotte Corday. The performances, however, which have most contributed to the reputation of this artist are the paintings on the ceiling of the foyer of the new opera-house in Paris, representing the Muses. These paintings are essentially modern and essentially French, and are as original as such works well can be without departing altogether from accepted artistic traditions. The different figures are interpretative in the sense of illustrating by their personalities no less than by other conventional signs the legendary attributes of the Muses, while they are in harmony with the architecture. It is greatly to be regretted that these paintings, although they have been in position only a few years, have already been greatly damaged by the gaslight. He has also executed other decorative works, as, for instance, The Triumph of Justice, on the ceiling of the Cour de Cassation. He received a medal of the first class in 1857, and was elected a member of the Academy of Fine Arts in 1870. (W. J. C., JR.)

BAUER, Bruno (1809–1882), a German rationalistic philosopher and critic, was born at Eisenberg, in Saxe-Altenburg, Sept. 6, 1809. He was educated in the University of Berlin, and was appointed a teacher of theology in that institution in 1834. In his youth he became a disciple of Hegel, and devoted himself chiefly to scientific biblical criticism. By a single bound he passed in 1839 from the orthodoxy of the school of Hengstenberg to the most negative position, asserting that the Gospels were wilful and conscious forgeries. He proposed to abolish religion, and to substitute reason, morality, and science. He had been appointed professor of theology at Bonn, but his extreme rationalistic opinions gave such offence that in 1842 he was deprived of his chair. He then returned to Berlin, and applied himself to critical and historical studies and the labors of authorship. His principal works on biblical criticism are—*Kritische Darstellung der Religion des Alten Testaments* (2 vols., 1838); *Kritik der evangelischen Geschichte des Johannes* (1840); *Kritik der evangelischen Synoptiken* (2 vols., 1840); *Das entdeckte Christenthum* (1843); *Die Apostelgeschichte* (1850); and *Kritik der Paulinischen Briefe* (1850). He afterwards turned his attention more to general literature, history, and political philosophy. Among his works of this class are—*Geschichte der Politik, Kultur und Aufklärung des 18 Jahrhundert* (4 vols., 1843–45); *Geschichte der Französischen Revolution bis zur Stiftung der Republik* (3 vols., 1847). He maintained his literary activity to the end of his life. Among his later works are—*Philo, Strauss, Renan und das Urchristenthum* (1874); *Einfluss des Engländischen Quäkerthums auf die deutsche Kultur* (1878); and *Disraelis romantischer und Bismarcks sozialistischer Imperalismus* (1882). While his theological views were radical and destructive, his studies in modern history, and especially of the French Revolution, led him to adopt conservative political principles. He died near Berlin, April 13, 1882.

BAUMSTARK, a German family noted for literary attainments and activity.

I. **Anton** (1800–1876), a classical philologist, was born at Sinzheim, Baden, April 14, 1800. He graduated at Heidelberg University in 1824, and was afterwards professor of classical philology at Freiburg for forty-five years. He edited many classical works, and prepared treatises on the political antiquities of Germany. He died at Freiburg, March 28, 1876. His autobiography was published in the same year by his son Reinhold at Freiburg.

II. **Eduard**, a political economist and statesman, brother of the preceding, was born at Sinzheim, Baden, March 28, 1807. He graduated at Heidelberg University, and in 1828 began to lecture on political science. His *Encyclopædie der kameralischen Wissenschaften* (Heidelberg, 1835) was the first complete work of the kind. In 1838 he was made professor extraordinary in the University of Greifswald, and in the next year was entrusted with the organization of an academy of political science and agriculture at Eldena. He retained connection with both institutions, and in a few years he became regular professor in the former and director of the latter. After the revolution of 1848 he was elected to the National Assembly, where he favored the establishment of constitutional monarchy. He was then the leader of the party of the Right, but the next year, when he became a member of the upper chamber, though holding the same principles, he was supported by the Left Centre. In 1851 he again became the leader of the opposition. In 1854, being chosen by his university a member of the House of Lords, he was still a prominent speaker on that side. Without intermitting his political activity, he became in 1864 curator of his university. In the German Parliament he supported the policy of Prince Bismarck, and strove to secure a thorough union of German interests. In 1878 his university celebrated the jubilee or fiftieth anniversary of his receiving the degree of doctor of philosophy, and conferred on him also the degree of doctor of law, while the University of Tübingen made him doctor of political economy. Among his publications are a translation of Ricardo's *Principles of Political Economy* (1837), to which he added a volume of "Illustrations" (*Erläuterungen*, 1838; last ed. 1878); treatises on income taxes (1849), on the history of the working-classes (1853), and on the means of improving their condition (1860). An early publication of his was a collection of popular songs of various nations under the title *Bardale* (Leipsic, 1836).

III. **Reinhold Ludwig**, son of Anton, was born at Freiburg in Aug., 1831. Studying at the university of his native town, he devoted himself to literature and jurisprudence, and entered on a judicial career. In 1868, Pope Pius IX. invited all Christian bishops to attend the Vatican Council, and addressed a letter to Protestants requesting them to consider the propriety of returning to union with the Catholic Church. Baumstark, then a counsellor of the court at Constance, published a work which attracted great attention and speedily passed through thirteen editions. It was called "Thoughts of a Protestant on the Pope's Invitation," and argued for a favorable response. Few, however, took the same view, but Baumstark, having thus shown an inclination to enter the Catholic Church, soon took the decisive step. In the same year he visited Spain, and his account of his excursion (*Ausflug nach Spanien*, 1868), which contains excellent criticisms on Spanish art and literature, was favorably received. He has published translations of Cervantes's minor novels and of Calderon's dramas, and a treatise on *The National Literature of Spain in the Time of the Hapsburg Kings* (Cologne, 1877). Among his works are lives of Francisco de Quevedo, Leopold I., Philip II., Daniel O'Connell, and Columbus. His autobiography, *Meine Wege* (1870), has been translated into several languages.

BAXTER, William Edward, M. P., a British statesman, merchant, and author, was born at Dundee, Scotland. in 1825. He was educated in the High School and University of Edinburgh. His father was a foreign merchant in Dundee, and the son succeeded to the business, being now head of the firm of W. E. Baxter & Co. He has travelled extensively in Europe, Asia, Africa, and America, and has published several volumes relating to these journeys. The first was *Impressions of Central and Southern Europe* (1850), then *The Tagus and the Tiber* (1852), *America and the Americans* (1855), *A Winter in India* (1882). In 1855 he succeeded Mr. Joseph Hume as representative of the Montrose burghs, and has since continued in that position. He was early invited to take office under the Government, but declined until 1868, when he became secretary to the Admiralty in Mr. Gladstone's first administration. In March, 1871, he became secretary of the treasury, which office he resigned in Aug., 1873. He was created a privy councillor March 24, 1873. Besides his works of travel mentioned above, he wrote *Hints to Thinkers* (1860) and *Free Italy* (1874).

BAXTER, Robert Dudley (1827–1875) an English statistician, was born at Doncaster, Yorkshire, England, in 1827. He was the eldest son of Mr. Robert Baxter, an eminent London solicitor. He was educated at Trinity College, Cambridge, and graduated B. A. in 1849 and M. A. in 1851. He was admitted a solicitor in 1852, and became a member of the firm of Baxter, Rose & Morton of Westminster. He was a fellow of the Statistical Society, and member of its council. He was also a fellow of the Royal Institution and other scientific associations. He died at Hampstead, May 20, 1875. He contributed many statistical and political letters to the *Times*, and was the author of the following works: *Railway Extension and its Results* (1866), *National Income of the United Kingdom* (1868), *Taxation of the National Kingdom* (1869), *English Parties and Conservatism* (1870), *National Debts of the World* (1871), *Recent Progress of National Debts* (1874), *Local Government and Local Taxation* (1874).

BAYARD, a family, including four members, distinguished in the public life of the United States, connected by their residence with the State of Delaware.

I. **James Asheton Bayard**, born in Philadelphia, July 28, 1767; died at Wilmington, Del., Aug. 6, 1815. He was descended from a Huguenot family of France, which, having fled into Holland, came to be represented about the middle of the seventeenth century in the settlement by the Dutch at Manhattan. Nicholas Bayard, who arrived there in 1647, was the nephew of Gov. Stuyvesant, his father, Samuel Bayard, having married Stuyvesant's sister. One of their sons, Peter, left New York and removed to Delaware in company with the Labadists (who settled at Bohemia Manor on Chesapeake Bay). In 1675 he received a grant of land at Bombay Hook, on Delaware Bay. James A. Bayard was educated at Princeton College, graduating in 1784, and after studying law in Philadelphia under Gen. Joseph Reed, was admitted to the bar in 1787, and began practice in Delaware, where he married the only daughter of Richard Bassett, governor and United States Senator from that State. In 1795 he went to England as American agent in ship cases growing out of the "Orders in Council," and in 1796 he was elected a representative in Congress, where he served three terms. In the exciting contest for the election of a President in the House of Representatives in 1801, the result depended largely upon the vote of Delaware, which, as that State had but one Representative, was in the control of Mr. Bayard. He decided in favor of Jefferson against Burr, under circumstances which caused then and subsequently much acrimonious political dispute. Mr. Jefferson the same year offered him the position of minister to France, but he declined it, and in 1804 he was elected United States Senator, serving as such until 1813, when, upon the offer of Russia to mediate in the war between Great Britain and the United States, Pres. Madison appointed him a commissioner, with John Quincy Adams and Albert Gallatin, to negotiate a peace; and he accordingly proceeded to St. Petersburg in May of that year. The Russian effort proving fruitless, he went in Jan., 1814, to Holland, and thence to England, but joined with Adams, Clay, Gallatin, and Russel at Ghent in the autumn of that year in negotiating the treaty of peace with Great Britain, signed in that city on Dec. 14. Returning to Paris in bad health, he received from Pres. Madison the offer of appointment as envoy to Russia, but declined it, and having reached the United States in June, he landed from the vessel at Wilmington quite ill, and died two months later.

II. **Richard Henry Bayard**, son of the preceding, born in Wilmington, Del., Nov. 15, 1796; died in Philadelphia, March 4, 1868. He was elected to the United States Senate in 1836, and served until 1839, and again served in that body from 1841 to 1845, taking a prominent part as a Whig. In 1850 he was appointed *chargé des affaires* to Belgium.

III. **James Asheton Bayard**, brother of the preceding and son of James A. (I.), was born in Wilmington, Del., Nov. 15, 1799, and died there, June 13, 1880. Differing from his brother in party preferences, he was a prominent and active Democrat. In 1851 he was elected to the United States Senate, and served continuously, by reelections in 1857 and 1863, until 1864, when he resigned. He had served for several years during this time as chairman of the judiciary committee. In 1860 he presided over the national convention of the wing of the Democratic party which, having withdrawn from the Charleston convention, met at Richmond, and subsequently at Baltimore, and nominated John C. Breckinridge for President. In 1867 he was again appointed to a place in the United States Senate, to fill a vacancy caused by the death of George Read Riddle, and when the legislature met he was chosen by it to complete Mr. Riddle's term, expiring March 4, 1869, while upon the same day the legislature also elected his son,

IV. **Thomas Francis Bayard**, to succeed him for the full term of six years following that date. Thomas F. Bayard was born in Wilmington, Del., Oct. 29, 1828, and received an education for commercial pursuits, chiefly at a school at Flushing, Long Island, under charge of the well-known Dr. Hawks. He entered a counting-house in Philadelphia, but the death of his elder brother, a lawyer, caused him to change his plans and to enter upon the study of law with his father. He was admitted to the bar in 1851, and served for some time under Pres. Pierce as United States district attorney for Delaware. During 1855 and 1856 he resided in Philadelphia, then returning to Wilmington. Being chosen to the United States Senate, as stated, in 1869, he was re-elected in 1875 and 1881, and remains (1883) a member of that body, in which he has taken a conspicuous position on the Democratic side. At the Democratic national conventions at St. Louis in 1876 and Cincinnati in 1880 he was prominent in the ballotings for a candidate for President, receiving 153½ votes on the first ballot in the latter body. He was a member of the electoral commission chosen by Congress in 1877 to count and declare the vote for President, and in Oct., 1881, at the special meeting of the Senate after the death of Pres. Garfield, he was elected president *pro tem.* of that body, serving, however, but a single day, when he was succeeded by David Davis of Illinois. (H. M. J.)

BAYBERRY, or sometimes **Wax-Myrtle**, is a name given to several species of *Myrica*, a genus which is the type of the natural order *Myricaceæ*, an order composed indeed of little more than the less than one hundred species included in the genus. It is a genus of low shrubs, in a few instances small trees, and has some relation to birches and willows. In the language of Dr. Asa Gray, "*Myricaceæ* is composed of monœcious or diœcious shrubs, with both kinds of flowers in short scaly catkins, and resinous, dotted, often fragrant leaves—differing from the birch family chiefly by the one-celled ovary with a single orthotropous ovule and the drupe-like nut. Involucre none." There is one famous European species, *Myrica Gale*, though this is oftener known as Sweet Gale than as a Wax-Myrtle. This is also native to Canada and the north-eastern portion of the United States. The one best known as Bayberry is *Myrica cerifera*, which abounds in sandy and low wet places along the whole Atlantic coast from Canada to Florida. The berries are about the size of those of red cedar, and often remain on the bushes several years; which indicates that they are no favorite with birds. They are covered with a gray waxy secretion, and indeed nearly one-third the whole weight of the seed is vegetable wax. When rendered from the berries, it is green, but becomes white when boiled over the second time. It is too brittle to be used to great advantage alone, and some small amount of animal tallow has to be mixed with it. It is obtained simply by boiling, the mass being stirred while boiling, and the wax skimmed off. When the water cools some wax can be had by straining the liquid. For the purpose of candlemaking the wax has been chiefly used in old times by people far away from commercial centres, and when the berries are treated in a rude way they only yield four pounds of wax from twelve pounds of berries. It seems rarely to have been able to compete with tallow in cheapness, but the grateful odor of the burning candles kept them for a long while in good demand. United States statistics show that a considerable demand for the wax existed up to 1868. During the war of the rebellion great use was made of the wax in the Southern States. Soap was also extensively made from it during that time. To three bushels and a half of common wood-ashes a half bushel of unslaked lime is added, well mixed together, and put into a cask with sixty gallons of water. After forty-eight hours draw off, and put from six to eight gallons into a copper kettle capable of containing twenty-five gallons, adding four pounds of the wax and keeping constantly at the boil for six hours. For the first three or four hours pour in occasionally a supply of strong lye, the whole frequently well stirred. After six hours' boiling put two quarts of common salt into the kettle, and then leave for one hour more to simmer over a slow fire. The liquor must be then placed in tubs to cool for twenty-four hours, when the soap may be taken out, wiped clean, and put out to dry. From its odor it makes a grateful shaving-soap. Forty-nine pounds of soap have been obtained from the above proportions. The European species has been used for tanning leather, and Dr. Peyre Porcher (*Resources of the Southern Fields and Forests*, p. 357) notes that it was freely used for this purpose at Charleston during the war referred to. The leaves, branches, and especially the root, are very astringent, and have been successfully employed in dysenteries, Rafinesque remarking that he can testify to its great merits from a trial on his own person. It has been used as a dye. Dr. Peyre Porcher, in the work cited, remarks: "The water in which the berries have been boiled, with copperas, is used as a dye. An excellent dark brown is made with but little copperas. If walnut leaves are added, it dyes a beautiful black. I am informed that in St. Johns, Berkeley, S. C., a blue dye is obtained without a mordant by using the same water repeatedly in boiling the berries for the extraction of the wax. This seems an unexpected result." Sealing-wax is also made from it, and it even furnished a tea in the old times. Indeed, in the early history of the Chinese tea, before the plant which yielded it was well known to be related to the camellia, it was supposed to be obtained from some species of *Myrica*. There are other species found in the United States, *M. Caroliniana* of the Southern United States being said to make a better wax than *M. cerifera*. It is a larger shrub. One in Florida, *M. inodora*, is still larger. On the Pacific coast, all the way from Puget's Sound to Mexico, one is found which attains the height of forty feet and is often two feet in diameter. (T. M.)

BAY CITY, the county-seat of Bay co., Mich., is on the Saginaw River, 4 miles from its mouth, and at the head of navigation. It is 108 miles N. N. W. of Detroit, is a terminus of both the Detroit and Bay City Railroad and the East Saginaw Railroad, and is on two other railroads. It has also communication with other places on the lakes by several lines of steamers. It is the third city in size in Michigan, deriving its importance from its manufactures of lumber and salt, in which it excels all other cities of the upper lake region. It is handsomely laid out, with broad streets, and the business part of the city is chiefly built of brick. It has the electric light, is supplied with water from Saginaw Bay by the Holly system, has two parks, two national banks, one State bank, four other banks, three daily and seven weekly newspapers, and is well supplied with hotels. It has seventeen churches, a high school with an excellent building, eight public schools, and a public library. On the other side of the river is West Bay City, a flourishing town, with which it is connected by three wrought-iron bridges. Bay City was incorporated as a village in 1859, and as a city in 1865. The improvements made in 1881 are estimated at $872,600. Population, 20,693.

BAYLEY, JAMES ROOSEVELT, archbishop of Baltimore, was born in New York, Aug. 23, 1814. He was the eldest son of Dr. Guy C. Bayley, an eminent physician. He early acquired a love of study. After preparing himself at a boarding-school near Amherst, Mass., he entered Trinity College at Hartford, Conn., where he graduated in 1835. He began the study of medicine, but soon gave it up, and studied for the ministry of the Episcopal Church under Dr. Jarvis of Middleton, Conn. After completing his studies he was made rector of an Episcopal church at Harlem, N. Y. He resigned this charge in 1841, and went to Rome, where, after a year's study, he was received into the Catholic Church. He then went to Paris, and studied theology for two years at the seminary of St. Sulpice. Returning to New York, he was ordained priest March 2, 1844, by Archbishop Hughes, whose secretary he became. For more than nine years he was an active missionary priest in New York. When the new diocese of Newark was created in 1853 he was appointed its first bishop. He was consecrated in the old cathedral of New York on Oct. 30, 1853, by Archbishop Bedini, the papal nuncio. Bishop Bayley was a prominent member of the second Plenary Council of Baltimore in 1866. He visited Rome in 1862 to witness the canonization of the Japanese martyrs; in 1867, to be present at the centenary of the apostles; and for the last time in 1870, when he attended the Ecumenical Council of the Vatican. He wrote a valuable *History of the Catholic Church in New York* (1853; revised ed. 1870) and (the *Life of Bishop Bruté* (1860; last ed. 1876). Upon the death of Archbishop Spalding, Bishop Bayley was translated to the see of Baltimore. When Archbishop McCloskey was appointed the first American cardinal, Archbishop Bayley, as the primate of the Catholic Church in the United States, was selected by Pope Pius IX as the apostolic delegate to place the beretta on His Eminence. He governed the archdiocese of Baltimore for five years, during which time he paid the debt of the cathedral and consecrated it, built several churches, ordained numerous priests, visited the whole of his diocese two or three times, and introduced many useful improvements. His health failing, he made a visit to Europe, but without benefit, in 1877, and, returning, died at Newark, N. J., on Oct. 3d of that year. His remains were taken to Emmittsburg, Md., and buried by the side of his aunt, Mother Seton, the founder of the Sisters of Charity in the United States. (E. L. D.)

BAYNE, PETER, a British writer, was born at Fodderty, Scotland, Oct. 19, 1830. He was educated at Marischal College, Aberdeen, where he gained two prizes—one for a poem and one for a prose essay. He at once entered upon a literary life, and became editor of the *Commonwealth* of Glasgow, then of the *Witness* of Edinburgh, and finally of the *Dial* and of the *Weekly Review* of London. His opinions concerning inspiration having created adverse feelings, he resigned in 1865 his editorial position, but continued to furnish articles to many journals. His *Biographical Essays* (Edinburgh, 1852–53) attracted considerable attention, and were followed in 1855 by *The Christian Life in the Present Time*, in which he sought to justify, by illustrious examples, the Christian faith. This work had a great success in America. He also published the *Life and Correspondence of Hugh Miller* (1871). In 1862 he published an *Essay upon the Puritans*, since which time he has closely studied the history of Puritanism, and issued in 1878 a work entitled *The Chief Actors in the Puritan Revolution*. He has been a contributor to the *Contemporary*, *Fortnightly*, *British Quarterly*, and *London Quarterly Reviews*. Of his other works may be mentioned—*The Testimony of Christ to Christianity; The Days of Jezebel*, a drama; and *Lessons from my Masters: Carlyle, Tennyson, and Ruskin* (1879). A later work is *Two Great Englishwomen: Mrs. Browning and Charlotte Brontë; with an Essay on Poetry, illustrated from Wordsworth, Burns, and Byron* (London, 1881).

BAYONNE CITY, a city in the S. E. part of Hudson co., N. J., between New York Bay and Newark Bay, extending south from Jersey City to the Kill von Kull. It is the shipping-port of large oil-refineries, and includes Port Johnston on the Kill von Kull, the largest coal-dépôt in America. It has also extensive manufactures of paint, copper, chemicals, agricultural implements, as well as saw- and planing-mills. It contains several stations on the Central Railroad of New Jersey, within 20 minutes' ride of New York, and is a favorite place of residence for the business-men of that city. It is divided into five wards, has eleven churches, five large public schools, and two weekly newspapers. It was formed in 1861 by a union of some villages into a town, and in 1869 became a city. Population, 9372.

BAY VIEW, an incorporated village of Milwaukee co., Wis., is 2 miles south of Milwaukee, on Lake Michigan, and on the Chicago and North-western Railroad. The Chicago, Milwaukee, and St. Paul Railroad also skirts the village. The place was settled about 1840, laid out as a village in 1867, and incorporated in 1879. The extensive iron-works are the chief industry of the place; it has two hotels, four churches, and two schools. Its property is assessed at $583,000, but is worth over $1,000,000. The public expenses for 1881 were $17,000, and there is no public debt. The population is of various nationalities, and in 1880 numbered 2052. The village of St. Francis, adjoining, contains a Roman Catholic college, seminary, convent, orphan asylum, etc. There are also glass-works in the vicinity.

BAZAINE, François Achille, formerly French marshal and imperial senator, born Feb. 6, 1811, of a military family. He enlisted in the army in 1831, and the next year was sent with his regiment to Algeria. After a service of four years he was promoted to a lieutenancy, and received a cross of honor on the battlefield. In 1837 he was transferred to the Foreign Legion for service against the Carlist bands in Spain. He returned to Algeria in 1839 with the rank of captain, and, having taken a distinguished part in several important actions, he was placed in charge of the military subdivision of Tlemcen. He was appointed lieutenant-colonel in 1848, and given the command of the first regiment of the Foreign Legion. When the Crimean war broke out, he was appointed, in 1854, to the command of a brigade, and was frequently mentioned in laudatory terms by Canrobert and Pelissier during the siege of Sebastopol for his skill in organization and his personal valor. When the Russians evacuated the place he was appointed its governor, and in Sept., 1855, promoted to be a general of division. In October of the same year he commanded the expedition against Kinburn, which, after three days' investment, he captured with 1500 prisoners and 174 guns.

When the unjust and ill-starred expedition to Mexico was fitted out he was, in July, 1862, appointed to the command of the first division of infantry, which disembarked at Vera Cruz. He left that city in December to take the command at Jalapa. In October of the next year he relieved Gen. Forey in the supreme command, and after several battles entered the city of Mexico on the 12th of July, 1863. There he organized a vigorous pursuit of Juarez, driving him to the extreme frontier. In Feb., 1865, he captured the stronghold of Oajaca, where he took 7000 prisoners. He was active in breaking up the lawless guerilla bands which infested the country. The success of the expedition seemed complete, but from that time many things conspired against it. It was evident that the heart of Mexico was against the Empire; the United States, just relieved from the burdens of the Civil War, could now confront the unjust scheme with energy; and there was a want of accord between Bazaine and Maximilian. It was decided to withdraw the French troops and leave the Empire and the emperor to their fate. The retreat began in Sept., 1866; place after place was abandoned, until the whole French army was concentrated at Vera Cruz and preparing to embark. Before leaving, Bazaine had declared to the Council of Notables that the establishment of a Mexican empire was impracticable and further strife hopeless. The French left Vera Cruz in March, 1867, and on the 18th of June in the same year Maximilian was shot at Querétaro, and the imperial *régime* came to an end.

In Sept., 1864, during his absence, Bazaine had been created a marshal of France. This gave him a right to a seat in the senate, which he took on the 17th of May, 1867. On the 12th of November he was appointed to the command of the third army corps, with his head-quarters at Nancy; and in Oct., 1869, he was made commander of the Imperial Guard. When war was declared by France against Prussia on the 15th of July, 1870, no general was regarded with more favor and hope. He acted with valor and vigor in the early battles, but was greatly trammelled in his plans and movements by the interference of the emperor Napoleon, who wished to conduct military affairs personally. On the 9th of August, Bazaine was in command at Metz, and on the succeeding days was engaged in the murderous battles of Longueville and Gravelotte. The result of these caused him to attempt a retreat upon Verdun, which was contested by the crown prince and Gen. Steinmetz in several battles and affairs, among which were Vionville, Doncourt, and Rézonville, resulting in great losses on both sides, but preventing the escape of the French. His hope to be able to co-operate with MacMahon also faded away, and at last he found himself shut up in Metz, with the alternative to cut his way through his enemies or to surrender. Competent judges think he should have done the former or have perished in the attempt. The situation became further complicated by the capitulation of Napoleon at Sedan, the fall of the Empire, and the proclamation of the Republic; these brought before his mind new political considerations. There seemed a divided authority; he was a marshal of the Empire; should he employ his army in the service of a revolutionary Republic? In this condition of things the astounding intelligence arrived in France that he had surrendered Metz, with all its armament and munitions and a French army of 170,000 men. This, in spite of a few efforts to stay the tide, was the true end of French resistance and the war. France had lost an army, and Germany had gained one. Paris must fall. Bazaine attempted to exonerate himself in articles published in Belgian journals by throwing the responsibility on the council of war which he had called before the surrender. But the public voice was loud against him; on his return to Paris in 1871 numerous petitions were sent in that he should be brought to trial before a court-martial. A court of inquiry decided that he should be tried. He was arrested and confined in the Petit-Trianon at Versailles, and a council of war or court-martial was appointed. It consisted of several generals, with the duc d'Aumale as president. A long paper was read by the judge-advocate, which was answered by the marshal in justification of his conduct. The result was that he was unanimously pronounced guilty of having permitted his army to lay down their arms in open campaign without doing all that his duty and honor required to prevent it, and of having surrendered Metz without exhausting all its resources. He was sentenced to military degradation and death, but was recommended to mercy by the court. Marshal MacMahon, who was then president of the French Republic, commuted the sentence to twenty years' imprisonment, without military degradation. This modification was haughtily received by the marshal, who said it saved his honor. He was taken on the 27th of Dec., 1873, to Ste. Marguérite, an island near Cannes, an historic place of detention for state prisoners; but, through the agency of his wife and several officers, he contrived to escape on the night of the 9th of Aug., 1874. He went first to Italy, and then to Switzerland, where he had a cordial reception in the castle of Arenenburg from the ex-empress Eugénie. He proceeded to England, where he wrote an account of his conduct in a work entitled *The Army of the Rhine from Aug. 12 to Oct. 29, 1870.* Numerous other justificatory pieces which were not his were attributed to him. (R. C.)

BEACONSFIELD, BENJAMIN DISRAELI, EARL OF (1804–1881), an illustrious English statesman and author, was born in London, Dec. 21, 1804. His family belonged to the Sephardim, or purest race of the Jews. The first of them who settled in England was Benjamin Disraeli, a Venetian merchant, who came to that country in 1748, and died at Enfield in 1817 at the age of ninety. His son, Isaac Disraeli (1766–1848), the author of *Curiosities of Literature* and other works which have become English classics, married in 1802 Miss Bassevi, by whom he had three sons and one daughter. Young Benjamin Disraeli was educated partly at home and partly at a private school, and we imagine that in the boyhood of Vivian Grey he has left us a picture of his own. He was at first intended for the law, and was articled at the age of seventeen to the firm of Swain, Stevens & Co., Old Jewry. Here his ability and assiduity were so marked that his father was advised to send him to the bar. Born, however, in a library, as he was fond of saying, he soon transferred his energies to a more congenial atmosphere. When little more than one-and-twenty years of age he published *Vivian Grey*, the most remarkable English work—except Congreve's *Old Bachelor* and Miss Burney's *Evelina*—which has ever proceeded from so young an author. He then determined to travel, and, accompanied by Mr. Meredith, a young man of great abilities and brilliant promise, visited in the next few years the most famous places of Europe and the Levant. Mr. Meredith died at Cairo in 1829, lamented by none more than by his fellow-traveller, whose sister he was shortly to have married. When Disraeli returned to England in 1832, his father had settled at Bradenham in Buckinghamshire, and the young man soon after presented himself to the electors at High Wycombe as the local candidate. Owing perhaps to his extravagant dress and manner, he was unfavorably received on the hustings, and was defeated by Col. Grey, a son of the prime minister. Yet how little effect on his self-confidence was produced by this reverse may be judged from the conversation which he held shortly afterwards with Lord Melbourne, then Home Secretary. The latter, interested in the young man's spirit and originality, asked him what he wanted to be. "I want to be prime minister," was the immediate answer—one which destroyed all Lord Melbourne's hope of being able to assist him. It is hardly surprising that such language as this, coupled with the singularity of his appearance and the audacity of his opinions, should have given rise to a report (mentioned by Southey in 1836) that his friends were concerned for his intellect. But the report had no other foundation than the wishes of the numerous enemies he had made by his independence, his sarcasm, and his unflinching assertion of opinions striking at the root of conventional politics.

Mr. Disraeli contested High Wycombe three times and Taunton once before he was finally returned for Maidstone at the general elections of 1833. During this interval he published his *Letters of Runnymede*, *The Crisis Examined*, and *The Vindication of the British Constitution*. In these essays he maintained the same theory of English parties which he had broached on the hustings and to which he adhered through life. They secured for him the friendship and admiration of Lord Lyndhurst, who interested himself warmly in his fortunes. During his contest for the borough of Taunton against Mr. Labouchere, Mr. Disraeli, referring to an agreement made by all sections of the Liberal party, used the strong expression that "the Whigs had seized the bloody hand of O'Connell." What he meant of course was that Daniel O'Connell's policy in Ireland must inevitably lead to bloodshed. But the phrase was taken up by all Disraeli's opponents, and he himself was reproached with treachery in speaking thus of O'Connell, whose assistance he had not scrupled to make use of at High Wycombe. The latter charge had practically no foundation. Some very violent letters passed between the original parties, and Disraeli, finding that O'Connell, having once killed a man in a duel, had made a vow never to fight another, sent a challenge to his son, Morgan O'Connell, who refused to be answerable for the language used by his father. O'Connell had called Disraeli "the descendant of the impenitent thief." Disraeli, when satisfaction was refused him by both father and son, publicly declared that he had "cowed the ruffian and his race." Neither of the two can be said to have left the court without a stain, for each was by his position debarred from the language of abuse.

In 1837, Disraeli attained the object of his ambition by being returned for the borough of Maidstone, together with Mr. Wyndham Lewis. At this period of his entrance into Parliament the effect of his extravagant dress was heightened by his flowing ringlets and pale Oriental countenance. The House of Commons has always been ready to ridicule anything abnormal or *outré*. The new member for Maidstone gave the House a foretaste of that mixture of rhetoric and sarcasm which afterwards made his fortune, but which was not sufficiently appreciated when first heard to counteract his special disadvantages. Moreover, his character as painted by his enemies had gone before him. The House was prepared to sneer. His maiden speech was in reply to O'Connell in a debate concerning an election subscription fund raised in England to encourage the presentation of petitions against the Irish members. The House refused to listen, but before he sat down Disraeli said, "I am not surprised at the reception I have experienced. I have begun several things many times, and I have often succeeded at last. I shall sit down now, but the time will come when you will hear me." Already in 1839 this prediction began to be fulfilled. On the presentation of the Chartist Petition he spoke in favor of taking it into consideration. His reasons were given at greater length and with more force in *Sybil* than in his speech. He did consider that the people of England had their true grievances to complain of, but he had to bear the usual taunts levelled at men who do not keep in the regular grooves of their party.

In the same year (1839) he married the widow of his former colleague, Wyndham Lewis, who brought him a considerable fortune, which, by placing him beyond the reach of pecuniary necessity and enrolling him in the ranks of the country gentlemen as proprietor of Hughenden, gave him the position which he wanted and enabled him to fulfil his early hopes. Within ten years of his entry into Parliament, within ten years of a failure which others had considered final, he had taken his place among the most important men in the House. Within twelve years he was leader of the opposition. In fifteen years he was chancellor of the exchequer and leader of the House, a statesman of established genius, an orator before whom the boldest quailed and the most callous winced. Perhaps the decade of years between the resignation of Lord Melbourne in 1841 and the resignation of Lord John Russell in 1851 may be considered the most interesting period of his career. In it he had shown himself a master of every weapon of oratory, of invention, humor, pathos—of arrowy satire which quivers in the victim's heart, and the circumambient irony which wraps him in a sheet of ridicule. In it he had set forth those views of English history, of English parties, and of the condition of the English people which, however ridiculed at first, tell their tale in the altered tone of public life which was subsequently perceptible, and in the different language thereafter adopted by the Tory party towards popular demands. In it he had established his title to be considered one of the leaders of men, and had become the stay, pride, and hope of the deserted and disheartened party which had once looked so coldly on his pretensions. To this position he had fought his way by his literature and his wit, and there were few moments of his existence on which he looked back with greater satisfaction than the conclusion of his first ten months of official life (February to December, 1852). He had rebuilt the Tory party; had lifted from the dust the flag of the country gentlemen of England; had formed out of them a Government which had conducted the affairs of the country with spirit and sagacity.

Disraeli was the first to see that in the earlier fiscal reforms of Sir Robert Peel lurked the germs of more extensive changes which might be forced upon him unless the Conservative party were both watchful and united. But he saw nothing in his Corn Bill or his new tariff to alarm the landed interest. In these measures, which it was understood were to be accompanied by a large system of commercial treaties, the minister was but following in the footsteps of Bolingbroke and of the younger Pitt. But when Sir Robert seemed gradually departing from the principles which he had held in opposition, Disraeli's tone began to change, though it was not on any commercial question that the note of discontent was first sounded, but on the Irish Arms Bill of 1843. All that we learn from Disraeli's speech at that time is his belief that a more comprehensive remedial policy was needed for the condition of Ireland. But the point aimed at was Sir Robert Peel's sudden change of front at the suggestion of the Irish corporations after he had taken office. The members of the Young England party, as Disraeli and his friends called themselves, protested against this course of action, but were sharply taken to task; and this was the beginning of the quarrel between these two statesmen. In 1844, Lord Ashley's Factory Bill and a proposed change in the sugar duties again gave rise to a collision between Sir Robert and his followers. In 1845, Disraeli led the chorus of disapproval which was called forth by the opening of letters at the post-office, and he received considerable support from the London press. In his speech on this subject occurs his memorable description of the Whigs having been caught bathing, and Sir Robert Peel running away with their clothes. His speech on the endowment of Maynooth is a *locus classicus* on party government, and has been said to be the first of his speeches that sunk deep into the public mind; yet it had the effect to break up the Young England party. On both these questions the ministry had been defeated by the votes of their own party, and were compelled to retract their judgment. Still superior to any of his previous speeches was that on agricultural distress in May, 1845, when the Government opposed the motion that "in relieving the burdens of the country due regard should be had to the necessity of affording relief to the agricultural interest." In it he draws the picture of the landed interest as Sir Robert Peel's cast-off mistress with a bitter humor and terrible truthfulness probably unequalled in the annals of satire. The speech concludes with the memorable declaration that the Conservative party was "an organized hypocrisy."

In looking back on the figures of Mr. Disraeli and Sir Robert Peel as they stand out in the political picture of forty years ago, we are frequently reminded of the relation which existed between the two great literary rivals, Pope and Addison. Both were men of uncommon parts—the one cold and a little supercilious, who had risen to eminence through all the regular avenues by which it is approached in Great Britain, the public school, the University of Oxford, the Under-Secretary's office, a master of Virgilian quotation, and the idol of the little senate which afterwards bore his name; the other the reverse of all this, a stranger to the freemasonry of public school and university life; outside of the entire circle of influences by which English statesmen had hitherto been moulded; conscious of ability second to none in that great assembly which had been taught to sneer at him; eager for distinction, eccentric, sarcastic, and vindictive: the elder man perplexed by a phenomenon so foreign to his own observation, irritated by sarcasm to which he was unable to reply, and a little afraid of powers which he did not possess himself; anxious to have the credit of treating his opponent with contempt, yet revealing the effect of the blows received by every effort which he made to conceal it: the younger one incensed by systematic depreciation and determined to make his strength felt; galled by the tone of superiority in which he was constantly addressed, and impatient of a supremacy which was maintained by keeping other men down. What private grounds of ill-feeling may have existed between the two may possibly be learned at some later time. It is said that Sir Robert Peel conceived a personal dislike for Mr. Disraeli, which the latter on his part delighted to aggravate by saying and doing things which he knew would shock Sir Robert's respectability. On public grounds the one great charge which the younger statesman brought against the elder was that he did not understand his own position. The keynote of the indictment is presented in a passage in the *Life of Lord George Bentinck*, where Disraeli points out the opportunity which Mr. Peel had, on the death of Mr. Canning, "of forming a strong and enlightened administration and rendering the Tory party famous and popular" by a "statesman like settlement of the two great questions—the admission of Roman Catholics into the House of Commons, and some reconstruction of that assembly itself." Disraeli's strong conviction that the Tories ought thus to have anticipated the Whigs, and that Sir Robert Peel was the chief obstacle in the way of its being done, led him to deny Sir Robert's title to the character of a great statesman, and constantly to refer to the principles of the Tory party in the eighteenth century. From the Revolution of 1688 to the death of the younger Pitt in 1806 the stream of Toryism had flowed on in one unbroken course, free trade, parliamentary reform, and relief of the Roman Catholics having been its three distinctive landmarks. Was the memory of this creed maintained in its purity for upwards of a century to be effaced by the blunders of a few men during little more than twenty years? It was monstrous. Sir Robert Peel should have educated his party as they were capable of being educated—should have taught them to look back to the days of Pitt, of Wyndham, and of Bolingbroke. If personal jealousies had made it impossible for Mr. Canning to do this, the field was clear for Mr. Peel. But he lost the chance, and when the ball came to the feet of Mr. Disraeli it was already too late. If it is asked why Mr. Disraeli should have come forward as the champion of protection, the answer would be that Sir Robert Peel had committed his party to that policy—that, supposing he must know best and following his instructions, his supporters had solicited the confidence of the electors on that very ground, and, having done so, they were not prepared to turn their backs on all their recent professions. Mr. Disraeli supported protection as far as it was necessary to secure for the landed interest its proper weight in the constitution. If we were asked to name the one article of his political creed to which he adhered throughout life with undeviating convictions, we should say it was the belief that the greatness of England was founded on what he used to call her territorial system. This is well set forth in a speech delivered at Shrewsbury in May, 1843, in which he replied to Mr. Cobden's attacks on the feudal system, and showed that the preponderance of the landed interest had made England able to resist even Napoleon, and that the territorial aristocracy gave stability to the constitution. With this view it was impossible for Disraeli to allow that the corn-tax was "a tax on the food of the people for the benefit of a single class;" on the contrary, it was, like other taxes that contributed to the support of institutions, conducive to the welfare of the public.

On the death of Lord George Bentinck in September, 1848, Mr. Disraeli became leader of the opposition in the lower House. This post fell to him almost by natural selection, though he himself has said that a speech made Aug. 30th on the "Reform Session" contributed not a little to his promotion. He had just the qualities of which the Conservative party at that time stood most in need. Almost all the official experience of the House of Commons was arrayed against them.

The debaters to whom they and the public had long been accustomed to look up with confidence and respect — Peel, Graham, Herbert, Lincoln, Goulburn, Russell, Palmerston—all were ready to discharge their batteries of logic, ridicule, and reproach on the doctrines which they had formerly professed. Sir Robert was never tired of lecturing his quondam followers on the absurdity of the opinions with which he had so sedulously imbued them. In Disraeli the Tories had the only orator capable of paying back with interest the taunts which were hourly heaped upon them. He retorted on the enemy with rallies which convulsed Europe, and after a while the Liberal party became very cautious of giving him an opening. Eloquence of this kind was more useful to him and to his party than the profoundest philosophy or the most dignified expostulation. He silenced one class of opponents; he taught the rest to keep their distance. With Lord Derby to lead them in the House of Lords and Disraeli in the House of Commons, the Conservatives had no cause to be ashamed. The battle was lost, but while they had such leaders they would often read a sharp lesson to those who pressed on their retreat.

Mr. Disraeli made his first speech on local taxation on March 8, 1849. This was followed up by another in July on the state of the nation. But he was unable to make much impression on the Conservative free-traders, and was beaten on each occasion by large majorities. In the following year, however, he was more fortunate, three resolutions which he had prepared for the relief of agricultural distress being defeated by a majority of only 21 in a full house, and Mr. Gladstone being among the ayes. In 1851 he pushed his advantage still further: on his motion that it was the duty of the ministers to introduce remedial measures at the earliest possible opportunity the division-list showed 267 in favor and 281 against it, a majority of only 14. Lord Russell's Government reeled under the blow, but did not immediately fall. The head of it was embarrassed by the Durham Letter, and when Mr. Locke King carried a motion against the Government for the extension of the franchise by a majority of 52, he was only too glad to avail himself of the opportunity. Lord Derby, however, was unable to form a Government, being disappointed in his application to Mr. Gladstone, in whose favor Mr. Disraeli would at that time have resigned the leadership of the House. As it was, Lord John Russell returned to Downing Street, and the ministry tided on to another session. Then, on the loss of Lord Palmerston and a defeat on the Militia Bill prepared for them by that statesman for the purpose, as he said, of "paying off John Russell," the Government resigned once more. Lord Derby this time was obliged to take office, and Mr. Disraeli, who had never held office of any kind before, became all at once chancellor of the exchequer and leader of the House of Commons.

Mr. Disraeli began his career as a financier while still to some extent hampered by the agricultural distress; he pursued it always in a minority and in the midst of affairs to which even the budget was secondary. Of one who has neither the power to enforce nor the leisure to mature his schemes the world is debarred from any estimate except such as is conjectural and speculative. That Disraeli took comprehensive views of the British financial system; that his own calculations were seldom falsified by the event; that he hit many real blots in the measures of his great rival, and was, if inferior to him, inferior to him alone,—this seems to be the general opinion of competent and impartial critics who have had sufficient opportunities of comparing the two men. In *Twenty Years of Financial Policy*, by Sir Stafford Northcote, and in a pamphlet published by Disraeli himself in 1864 reviewing Mr. Gladstone's finance from 1853 to 1863, will be found the best account of his claims to our respect as chancellor of the exchequer.

The general election of 1852 did not give Lord Derby a majority, but it raised the number of his followers to nearly 300; and Mr. Disraeli always thought that if his financial statement could have been made at the ordinary time the Government might have gradually gathered strength and held their own. The Liberal party demanded that Parliament should assemble in November, and that the chancellor of the exchequer should unfold his policy at once. As agricultural distress still lingered, Mr. Disraeli could not frame his budget without some recognition of it. He therefore proposed the remission of half the malt-tax and the assessment of the income-tax on one-third the farmer's rental instead of one-half. To compensate for these concessions, he was obliged to extend both the house-tax and the income-tax to classes which had previously been exempt from them. These proposals were fatal, and on the last night of a debate which extended from Dec. 10th to Dec. 18th he saw that he was doomed. Then, turning on the new coalition of Whigs, Radicals, and Conservatives, formed solely for the purpose of driving out Lord Derby, he poured forth one of those fierce declamations which live in the history of senates and in turn become political landmarks. Mr. Disraeli's oration called up Mr. Gladstone, who lectured the "Tory upstart" for his remark that though he greatly regarded Sir James Graham, he did not greatly respect him—a remark which can readily be explained that the speaker did not respect Sir James as a financial authority, though Mr. Gladstone chose to take it in a different sense. Mr. Gladstone's speech was very strong, and the Government was beaten by a majority of 19. As Mr. Disraeli, however, had foretold, in the division of the spoils the Whigs and the Peelites got the oyster and the Manchester men the shells. The time soon arrived when the latter bitterly repented of the vote they gave that night, but the mischief was done. A coalition Government meant a divided cabinet, and a divided cabinet meant weakness, perplexity, and procrastination. Russia crossed the Pruth, and England drifted into the Crimean War. Mr. Disraeli never forgave the coalition, and for many years seized eagerly on every opportunity of exposing its unprincipled character.

After the accession of Lord Aberdeen to power in 1852, Mr. Disraeli, in conjunction with Lord Derby, established *The Press*, a weekly newspaper founded on the model of the *Anti-Jacobin*. It was a combination of serious political articles with squibs, poetry, and imaginary conversations. Mr. Disraeli wrote the first leader, and the present Lord Derby (then Lord Stanley) was a regular contributor. *The Press* continued in its original hands till 1858, when it passed into the possession of a different section of the Conservative party.

During the Crimean War, Mr. Disraeli abstained from any attempt to embarrass the ministry, though in his speech of May 24, 1855, he drew attention to the conduct of the Vienna negotiations, exposing the deplorable diplomacy and vacillating counsels of the British ministry. Before this occurred, however, the fall of the coalition ministry had given Lord Derby another chance of office, but he again declined to become responsible for the government of the country without the assistance of some of those statesmen with whom he had formerly been connected. Mr. Disraeli never ceased to lament the opportunity which was then lost for the Conservative party to regain its strength. Between 1855 and 1858 the course of events may have seemed to tend towards some similar arrangement. Disraeli and Gladstone voted together against the financial measures of Sir G. C. Lewis. Mr. Gladstone was growing every day more and more estranged from Lord Palmerston and more and more inclined to a union of the Peelites with Lord Derby. And yet when, in 1858, Lord Palmerston retired to make room for Lord Derby, Mr. Gladstone refused to form part of the administration. In this second Derby Government Mr. Disraeli again became chancellor of the exchequer.

The question of the day was parliamentary reform, yet at first the affairs of India excited perhaps greater interest. The Indian mutiny still smouldered, though it was finally quelled during Lord Derby's administration. A despatch written by Lord Ellenborough, the new president of the Board of Control, in disapproval of a letter issued by Lord Canning, the governor-general of India, became public, and was seized upon by the opposition as a favorable opportunity for a furious attack. Lord Ellenborough resigned, but when the time came which had been appointed for a vote of censure on the Government the movement collapsed, and the withdrawal of the resolution took place amid a scene of confusion which has rarely been equalled in the House of Commons. It was wittily described by Mr. Disraeli a few days later as reminding him of an earthquake in Calabria. For the remainder of the session the Government was safe, and the India Bill was carried through the House under the management of Lord Stanley.

The new prime minister had decided on bringing in a Reform Bill, but that he was led to this conclusion mainly by his enterprising colleague there can be no doubt. The adoption of parliamentary reform by the Conservative party was the work of Mr. Disraeli; and for either the good or the evil which that momentous decision has produced he must be held responsible. He has been blamed for lending his great powers to the furtherance of a change prejudicial to the stability of the constitution. Yet long before a Conservative Reform Bill was thought of it was evident that the settlement of 1832 was not to be allowed to stand. It is true that for many years the Whigs showed greater alacrity in bringing in Reform Bills than energy in passing them. Both the country and the House of Commons were on the whole apathetic on the subject. But while the Whigs and the Tories, neither of whom really loved reform, stood looking on in doubt and hesitation, the Radical minority whipped in between them and became master of the situation. A Reform Bill was introduced and withdrawn in 1852, another in 1854, and in the queen's speech in 1858, Lord Palmerston was obliged to include the mention of a third. Under these circumstances there were but two alternatives: either the more conservative section of the Whig party might have effected a juncture with the Tories on the basis of resistance to reform, justifying their attitude on the ground that there was no real popular demand for it, or the question must have been allowed to drift till a Government should be found both willing and strong enough to settle it. Mr. Disraeli, alive to the danger of drifting, recommended his chief in 1859 to make an honest attempt to grapple with the question. The bill introduced in that year was founded on the principle of uniformity of suffrage between town and country, but it was not carried. Lord Derby resigned, and the question again began to drift. In 1860, Lord Palmerston's Government made a more feeble and equally unsuccessful effort to terminate the agitation; and thereafter a running fire of measures was kept up by private members with little aid from the Government. With the death of Lord Palmerston in 1865 the Radical party began to renew their demands on the Liberal leaders, and, the latter yielding to the pressure, Lord Russell's Reform Bill was introduced, debated, and defeated.

In July, 1866, for a third time Mr. Disraeli found himself chancellor of the exchequer and leader of the House of Commons. The course of events had strengthened his conviction that the reform question must be settled in some manner. Six Governments by introducing measures on the subject had acknowledged that some change was necessary. Parliament had recognized the want, and Parliament must satisfy it. After full consideration the cabinet agreed to lay before the House of Commons a series of thirteen resolutions embodying certain general principles which Parliament was requested to accept as the basis of legislation. In explaining the reasons for this course, Mr. Disraeli dwelt on the fact that five Governments in succession had tried to settle the question, and had all failed in consequence of the opposition of the House, yet that opposition had not caused the question to disappear. "Let Parliament therefore, which would allow no one party to carry a bill, carry one itself, and cease to act like the dog in the manger." But the Liberal party shrank from the step, and the resolutions were withdrawn. There was no alternative but to proceed by bill. The cabinet, however, was divided, and to avert the resignation of Lords Cranbourne and Carnarvon and General Peel a measure different from that which the two leaders had long had under consideration was devised at very short notice and submitted to the House. Mr. Disraeli had offered to resign rather than break up the cabinet or undertake a task so much to his own distaste, but he was overruled. The Ten Minutes' Bill was born only to perish, but a meeting then held at the Carlton Club determined the conduct of the Government. The dissentients in the cabinet resigned, and a new measure was introduced extending the suffrage to all rate-payers in the towns and to the occupiers of lands or houses worth £12 a year in the country. In the progress of this Reform Bill of 1867, Mr. Disraeli's rare combination of qualities, force of character and strength of will, consummate tact and natural good temper, earnestness and wit, courage and discretion, enabled him to triumph over obstacles which seemed insurmountable. Whatever we may think of the statesman, it is impossible to withhold our sympathy and admiration from the hero. He fought his battles with the pluck of a Rupert and the sagacity of a Wellington.

In February, 1868, Lord Derby, who had long been in failing health, retired from the Government, and Mr. Disraeli became prime minister. He had realized the dream of his youth; the "foolish notion" which Lord Melbourne bade him put out of his head had ripened into actual attainment, and he no doubt looked forward to a permanent and prosperous term of office. But Mr. Gladstone brought forward resolutions on the disestablishment and disendowment of the Irish Church, which appealed to the sympathy of the Radicals and Nonconformists more strongly than even the Reform Bill, and were adopted by a majority of 65. Parliament was dissolved in July, and in November the new elections took place. Mr. Disraeli was not prepared for the result: speaking at the lord mayor's table a short time before the election he indulged in confident anticipation of victory. But the elections went strongly against him, and he resigned without meeting Parliament.

From January, 1869, to January, 1874, when Mr. Gladstone dissolved the first Parliament returned under the new franchise, Mr. Disraeli could make little head against the powerful ministerial phalanx. Nor, indeed, were his own private sentiments so remote as those of some of his supporters from the Irish policy of Mr. Gladstone at that time. He was rather disposed to refrain from opposition to the second reading of the Irish Church Bill, thinking it might be better for his friends to reserve all their strength for making a good bargain in committee. He himself many years before, in a speech on the condition of Ireland, had mentioned "an alien Church and an absentee aristocracy" as among her principal evils, and he reminded his hearers of what Charles I. had been willing to do for the Irish Roman Catholics. It is probable that in this speech, delivered in 1843, he took that view of the Irish question which was most natural to him and most in unison with his general theories. But circumstances forced him, as they had forced Mr. Pitt before him, into a different position, and some years later threw him into an attitude towards Church parties which to "descendants of the Cavaliers" must have been far from pleasing. To the Land Act he was opposed, because the Irish landlords had returned to their duty, and he believed that many more deserved the high eulogium which Mr. Gladstone passed on the English landlords than the prime minister would allow. With the third year of Mr. Gladstone's administration difficulties began to thicken round the Government. Mr. Disraeli had numerous opportunities for the display of his peculiar powers. In April, 1872, he delivered the famous speech at Manchester in which he likened the ministers to "a range of exhausted volcanoes." In the following June he spoke at the Crystal Palace on the principles of Toryism, explaining that the three great objects for the sake of which Toryism existed were—first, the maintenance of the national institutions, the university, the Church, and the aristocracy; secondly, the maintenance of the empire; and thirdly, the elevation of the condition of the people. Here was Mr. Disraeli's early creed as fresh and as intact in 1872 as it had been in 1832. The Constitution, the Empire, and the People! These were the noble words which he had inscribed on his banner from the first, as true to them when struggling for existence as in the plenitude of his fame and power, the leader of England's aristocracy, the champion of her imperial greatness, and the author of the most popular political reform which had been effected in the nineteenth century.

In December, 1872, Mr. Disraeli experienced a loss which it is hardly too much to say robbed his existence of its sunshine. In that month Maria Lady Beaconsfield, "the perfect wife" who had gloried in his triumphs and lightened his reverses, and whose sympathy with his political career was the genuine product of her nature, died at an advanced age, and left the bereaved statesman to the darkest hour of his existence. But events were now impending which forbade Mr. Disraeli to seclude himself even for a brief interval from public life. In the session of 1873, Mr. Gladstone introduced his Irish University Education Bill, which, failing to satisfy the Irish bishops, was defeated on the second reading by a majority of 287 to 284. Mr. Disraeli spoke on the last night of the debate, and, if the leading English journal can be trusted, his speech just turned the scale. The Government at once resigned, and the queen sent for Mr. Disraeli. To Her Majesty the Tory leader said that he was quite prepared to form an administration, but not in the present Parliament, nor was he willing to undertake the task even with Her Majesty's permission to dissolve Parliament.

Mr. Gladstone, finally feeling that he could not go on any longer with the existing House of Commons, dissolved Parliament in the following January. The elections went everywhere in favor of the Conservatives, and at last, in his seventieth year, Mr. Disraeli found the long-coveted position his own, and took his seat in the House of Commons as prime minister at the head of a powerful majority.

Twenty-seven years had passed away since the Conservative party had occupied the ministerial benches in right of the popular judgment. Almost all the old leaders had now disappeared, and by common consent Mr. Disraeli and Mr. Gladstone towered as high above all their colleagues and contemporaries as did Achilles and Agamemnon above all the chiefs of Greece. It may be said, indeed, that from the resignation of Lord Derby in 1868 to the resignation of Lord Beaconsfield in 1880 the game of politics was little else than a duel between these two eminent men. Although Mr. Gladstone now resigned the leadership of the Liberal party, an office which devolved on Lord Hartington, it was really the ex-premier who continued to do the work of the party outside the halls of Parliament.

The new ministry had hardly been two years in office when a serious depression of trade and agriculture began, while the revival of the Eastern Question and the Russo-Turkish War which followed plunged them at once in difficulties of no ordinary character. Agricultural distress bred discontent and disaffection among the natural adherents of the Government, which, when assailed for its foreign policy with all the impassioned vehemence of which Mr. Gladstone is a master, had nowhere to turn for that hearty and unflinching support on which it might otherwise have calculated. Moreover, the Government was exposed to a disadvantage which perhaps, when it was originally formed, had not been contemplated. The head of it became gradually aware that his powers were no longer equal to the task of leading the House of Commons. During the session of 1876 he made up his mind to seek a more serene atmosphere, and leave to younger hands the immense labor which now devolves upon every prime minister whose seat is in the lower House. On the 11th of August, 1876, he made his last speech in that assembly in which he had so long "drunk delight of battle with his peers," and the next morning it was announced that Mr. Disraeli was henceforth to be known as the earl of Beaconsfield.

The foreign policy of Lord Beaconsfield was highly appreciated and heartily approved of by a large part of the English people. The Treaty of Berlin in July, 1878, was greeted with fervent enthusiasm. The new Indian frontier was perhaps the best security for the tranquillity of Afghanistan. The war in South Africa had been forced upon the Government by a combination of circumstances which, however unfortunate, was not very easy to resist. When Lord Beaconsfield returned to London from Berlin in the summer of 1878 his progress from Charing Cross to Whitehall Gardens was one long triumph. It is certain that no man in England, since the death of the duke of Wellington, had ever been so popular as he was at that moment. Yet as the enthusiasm waned the contrast still rose before the public eye in all the colors which malignity could devise. A stagnant trade and a ruined agriculture at home, costly wars and perilous obligations abroad,—where were the good old days of peace, plenty, and economy?

Lord Beaconsfield's administration will hereafter be remembered for many salutary measures of domestic legislation which in less exciting times would have earned for it lasting popularity. It settled the long-standing disputes between masters and workmen. It effected sanitary reforms of the most important character. It preserved for the people the enjoyment of all those wastes and commons in the neighborhood of the English towns which had not yet been appropriated by the wealthy. Yet the administration fell suddenly at the elections of 1880, without a note of warning, and the Liberal Government reappeared with a majority of 150. Many people had expected a hard fight—some, and among them Lord Beaconsfield himself, had grave doubts whether a Conservative majority would be returned at all. But still they looked forward only to a very balanced state of parties, in which the Conservatives would be strong enough to prevent their policy from being reversed. Friend and foe alike were astonished by what actually occurred.

The three things which raised the greatest clamor at the time against Lord Beaconsfield's Government were the Public Worship Regulation Act, the Royal Titles Bill, and the summons of Indian troops to Malta. Surely it is the duty of every state to turn all its resources to the best account, and no reason whatever can be given why England should not use Indian troops in a European war, provided they were willing to come. Notwithstanding the opposition in Parliament to the assumption by Queen Victoria of the title of empress of India, the spirit shown by Lord Beaconsfield was highly popular with the people, who were gratified by discovering that England was a greater military nation than they had been in the habit of supposing, and who saw in "the empress of India" the natural and appropriate title of the successor of Aurungzebe and Tamerlane. The enthusiasm stirred up in the popular mind by the bold and vigorous foreign policy of the Conservative Government found expression in some doggerel verses which were sung in all the music-halls in London, and procured for it the nickname "Jingoism." But in spite of all that the opposition wits could do to turn it into ridicule, the heart of the British nation kept tune with the cockney melody.

The Public Worship Regulation Act, which was simply a more expeditious Church Discipline Act, was certain to give very great offence to the High Church party; and it would doubtless have been wiser in Mr. Disraeli to have left it to the House of Commons instead of virtually making it a Government measure. Mr. Disraeli was indeed personally opposed to it, and we think his usual sagacity deserted him when, in deference to the sentiments of his party, he allowed himself to become the godfather of a measure for "putting down Ritualism." This unfortunate expression was never forgiven by those at whom it was directed.

While the elections were in progress Lord Beaconsfield was residing at Hatfield, the seat of Lord Ashburton, in Hertfordshire, and various were the accounts given of the effect which the result produced upon him. Conscious of his own high aims, and satisfied that he had steered his country in safety through a perilous crisis in her fortunes, he may have looked forward with calmness to the verdict of history, and not have been sorry to escape from the wearisome misrepresentations, calumnies, and obstructions which he encountered upon every side. At all events, it was matter of common observation that he comforted himself under these trying circumstances with remarkable dignity, and that he never allowed a syllable to escape his lips indicative either of mortification or resentment.

It was the object of Lord Beaconsfield in the Treaty of Berlin to close against Russia the two approaches to the Mediterranean, and by occupying Cyprus to command her path through the Euphrates Valley. By it he believed he had prevented the possible subversion of the balance of power in the Mediterranean, as well as serious danger to the British possessions in the East. His entire foreign policy was to arrest the advance of Russia towards either Constantinople or Cabul by depriving her of all pretext for it. But the attitude assumed by Mr. Gladstone and his colleagues towards Ireland seems to have caused more serious disquietude to Lord Beaconsfield than any other consequence of the change of Government. In August, 1880, he strongly denounced the Compensation for Disturbance Bill. In the following January he traced the condition of Ireland, which had even then become terrible, to the conduct of the Liberal Government in not renewing the Peace Preservation Act, and in disregarding all the assurances and all the information laid before them by their predecessors on quitting office.

But his long and arduous career was now over. On the 23d of March the announcement appeared in the papers that Lord Beaconsfield was suffering from a slight cold. Six days later the slight cold had become a severe attack of bronchial asthma. His strength of constitution enabled him to fight for more than three weeks against the combination of bronchitis and gout by which he was assailed, but he was never sanguine of recovery. His attendants were Dr. Oram and Dr. Kidd, the latter a homœopathist, with whom the former could co-operate only after receiving a written assurance that Lord Beaconsfield had not been treated homœopathically. But, orthodox or heterodox, medical science proved unable to conquer the disease, to which the patient finally succumbed early on the morning of Tuesday, the 19th of April, 1881.

England mourned for Lord Beaconsfield as she mourned for Wellington and Pitt, as we mourn for men on whom we have long relied as a sure defence in time of trouble, and whom we feel it is impossible to replace. Foreign nations bore their testimony to his greatness, and the press of Europe pronounced his funeral oration in terms of reverential homage.

That Lord Beaconsfield should be buried in Westminster Abbey was the natural expectation of his countrymen, but he himself in his will had given directions for his burial at Hughenden. The funeral accordingly took place on the 26th of April in the West Buckinghamshire church, attended by a vast concourse of persons in every rank of life. The prince of Wales, the duke of Connaught, and the duke of Albany stood beside his grave, while the road to it was thronged by thousands of laboring men and women. A few days afterwards the queen herself paid a visit to the church and laid a wreath of flowers on the coffin. Nor did Her Majesty's anxiety to express the personal regard which she entertained for him end here. By her own directions a marble tablet was placed upon the church-wall commemorating Her Majesty's affection for her faithful and devoted servant.

Westminster Abbey, however, was still to receive his monument if it was not to receive his dust, and on the occasion of proposing in the House of Commons the vote which was required for the purpose, Mr. Gladstone paid a tribute to his former rival of which for its felicity and dexterity Lord Beaconsfield himself might have been proud.

Lord Beaconsfield's rank as a statesman is not to be determined by the number or the quality of the measures which he has placed upon the statute-book, but by the influence which he exercised in his lifetime on the course of public affairs both at home and abroad, by the marks which he has left on the national institutions and the national character, and by the degree in which his policy has affected the position of England among the nations of the world. For good or for evil he transferred political power at home from the middle to the laboring class; for good or for evil he reasserted the right of England to a potential voice in the territorial arrangements of Europe, forced the grasp of Russia from the throat of Turkey at the very last moment, and extorted from every man the admission that he had replaced England in her former eminence; for good or for evil he taught both Russia and India to understand that England would tolerate no tampering with the boundaries of her empire and no schemes of aggrandizement likely to endanger its security. Whether this policy was mistaken or not, it was generous and it was glorious.

Those who fancied that they saw all through Lord Beaconsfield's career traces of the democratic creed with which they supposed him to have begun its understood neither the man nor his epoch. He had peculiar ideas of his own derived from independent study, and on these he had engrafted others which he had found in the writings of Cobbett. The plunder of the English monasteries had either created or enriched a class of families in England who were naturally interested in preserving what they had got, and who trembled for their estates should the Roman Church regain her old supremacy. Hence the revolution of 1688 and the origin of the Whig party, who required the powers of which they then deprived the Crown for the sake of the property of which they had despoiled the Church. These objects they dignified with the title of civil and religious liberty; and it was this enormous "sham" which provoked the unrelenting hostility of Mr. Disraeli throughout the greater part of his career. He wished to do for modern English history what philosophic research has done for ancient Roman history—to remove the coating of falsehood which concealed its real character, and the color with which partisan writers had embellished its principal events.

> "Let me see," says Coningsby, "authority once more honored; a solemn reverence again the habit of our lives; let me see property acknowledging, as in the old days of faith, that labor is his twin-brother and that the essence of all tenure is the performance of duty,—let results such as these be brought about, and let me participate, however feebly, in the great fulfilment, and public life then indeed becomes a noble career and a seat in Parliament an enviable distinction."

We can trace in these ideas the influence of Carlyle as well as of Cobbett. In Carlyle they took a very different outward form, but both alike detected the smug and shallow utilitarian liberalism which fancied that society could thrive on a diet providing no nutriment whatever for the nobler part of human nature.

The revival contemplated in *Coningsby* did not succeed. It was just as impossible in the middle of the nineteenth century to restore the Toryism of the eighteenth as to restore the Anglicanism of the seventeenth. Some of the greatest intellects in England were devoted to the latter task, and as they failed Mr. Disraeli failed. Both attempts, however, were productive of valuable consequences in elevating the general tone of ecclesiastical and political life. Every Englishman knows that the publication of *Coningsby* and *Sybil* has taught the English aristocracy a higher conception of its duties, and that since the publication of the *Tracts for the Times* the theology and practice of the English Church have lost much of their dryness and narrowness; and that these changes have been of great importance.

Coningsby was published in May, 1844, and was followed by *Sybil* exactly one year afterwards. The aim of *Sybil* was to illustrate the "condition of the people," and in its pages we find the chief traces of the hand of Cobbett. The latter, in his *History of the Protestant Reformation*, has supplied many of the arguments which are put into the mouth of Walter Gerard, the Roman Catholic and Chartist hero, the impoverished descendant of an ancient family, and the father of the heroine Sybil. The estates of the Church are "the patrimony of the poor." By the dissolution of the monasteries the poor were robbed as well as the monks. Society has suffered too. The monasteries educated the people and paid the poor-rate. They were easy landlords, and granted long leases. The land given for these public objects had been seized by court favorites, and served the poor no longer. Then in *Sybil* we have the condition of the manufacturing populations in the northern towns of England, which Mr. Disraeli visited himself in 1844, set before us in very vivid colors—colors, in fact, which awoke public attention to the horrors of factory-life. It had previously been supposed that the agricultural laborer was the lowest unit in the social scale. There was found to be a lower still; and when the free-traders in Parliament took to abusing the country gentlemen, the latter bade them look at home. The truthfulness of the social pictures presented to the world in *Sybil* has been generally recognized, nor is it easy to gainsay the criticism suggested by them on the policy of Henry VIII.

It has been said by an eminent English critic that by the devotion of Lord Beaconsfield to politics England lost another Fielding; and it is certain that full justice has never yet been done to the immense dramatic power visible in his novels. In *Henrietta Temple*, *Coningsby*, *Sybil*, and *Tancred*, the four best which he has written, this faculty is the most conspicuous. If we examine the two best known of them, we find characters depicted with all the delicacy and finish of Miss Austen or George Eliot; dialogue at once familiar, natural, and piquant, sustained without an effort; a humor that is perfectly original and unique; and an eloquence which, whether employed on the grandeur of nature or the passions of humanity, carries us at times into the very highest regions of literary art. There are few finer things in English prose literature than the description of Syria in *Tancred*—a book which may also be consulted with profit for the purpose of ascertaining Lord Beaconsfield's real views about the Eastern Question. No one well acquainted with the fascinating tale can doubt for a moment that in resisting the advances of Russia it was Turkey, and not the Turks, whom Lord Beaconsfield was supporting, for he is always careful to distinguish between the Turks and the Arabs, counting the former, in comparison with the latter, as little better than barbarians. He himself was a descendant of "the sheik Abraham," and he was prouder of this pedigree than he would have been of the blood of Charlemagne. His devotion to his own race, and that at a time when the Jews were not popular in England, was always regarded with admiration by his worst enemies. They forgot perhaps that he regarded the Semitic race as the aristocracy of nature, before whom the patricians of Europe were but as the mushrooms of the morning. In his great works of fiction he has built up a monument in honor of his own people and his father's house which the proudest and most powerful nations of modern Europe might well covet; while he himself has added another to the long list of statesmen and artists which the land of Judah has given to the Western World to mould the destinies and captivate the tastes of millions who affect to despise it.

A long interval elapsed between the publication of *Tancred* and the next appearance of Disraeli in the field of fiction. The world indeed had long ceased to expect anything further from his pen when suddenly in the year 1870 it was surprised by the announcement of *Lothair*. *Lothair* is the story of a young English nobleman who after a long minority succeeds to enormous possessions, and whose support is solicited in turn by the Italian revolutionists and the English Catholics. He throws in his lot with the former, but is afterwards almost forced into the Roman Church. He bursts his bonds, however, and gets back to England to marry the Lady Corisande, the daughter of a ducal house which it is not very difficult to identify. The novel is spirited and interesting, abounding in fine sketches of English society. Ten years afterwards appeared *Endymion*, a story which begins with the death of Mr. Canning. In it we have clearly enough a picture of Louis Napoleon in his youth, of Lord Palmerston, of Lord Herbert of Lea, and of other celebrities; but as they occasionally change clothes with each other, the effect is bewildering, and we are satisfied with perceiving that in several passages Lord Beaconsfield is referring to quite recent events, and is occasionally taking a sly revenge on his political opponents.

Vivian Grey, as we have seen, was published in 1825. It is the dream of an ambitious boy conscious of pre-eminent abilities, but as yet unacquainted with the world and unable to distinguish between what is only impossible and what is wild, extravagant, and fantastic. *The Young Duke*, a fairly good novel of fashionable life, was published in 1829; *Contarini Fleming* in 1832; *The Wondrous Tale of Alroy* and the *Rise of Iskander* in 1833; the *Revolutionary Epic* in 1834; *Henrietta Temple* in 1836; and *Venetia*, a novel in which he attempts with indifferent success to delineate Shelley and Lord Byron, in 1837. The majority of these are probably known but in name even to what is called the reading public, and only one of them deserves a better fate. *Henrietta Temple* is certainly one of the prettiest love-stories in the English language—a kind of modern *Romeo and Juliet*, without its tragic termination. The others, without any injustice to the author, may be forgotten even by librarians, or remembered only by some future collector of the curiosities of literature.

We have already considered Lord Beaconsfield's talents as an orator. His strength lay in sarcasm and in all the tributary faculties by which it is nourished and accentuated. Some of his speeches on the agricultural interest and on the territorial system of Great Britain, and some others on the foreign policy and the interests of the British empire, are marked by eloquence of a higher order and a graver character. But it is as a great master of parliamentary invective in all its forms that he will chiefly be remembered, for in that he has had no master and no equal, nor is it probable now that he ever will have. His voice was excellent, capable of infinite modulation, and adapting itself easily to all the requirements of debate. His elocution was imperfect, much inferior to Mr. Gladstone's, though his very hesitation occasionally added point to his epigrams. His action was not usually energetic. He was fond of speaking with his arms folded across his chest or with his hands planted on his hips. But his wave of the arm could express the very quintessence of scorn, and the gleam of his black eye seemed intended by nature to warn the world that he was dangerous. In person he was about the middle height, and in his youth he had the robustness of an athlete. His figure was perfectly formed, and he retained it to the last.

In the private tastes and habits of public men the world is legitimately interested, and no sketch of Lord Beaconsfield would be complete without some reference to his life at Hughenden. Hughenden (or Hitchenden) Manor-house is beautifully situated on the southern slope of the Buckinghamshire Cheltern Hills, where the woody range which runs in a southerly direction from Tring towards Goring begins to sink into the valley of the Thames. It is girdled by the beech-groves for which this part of the country is so famous, and from which, indeed, the county of Buckingham is thought to have derived its name. It lies in the centre of a neighborhood rich in objects of historic interest, and of these Lord Beaconsfield loved to talk to any sympathizing visitor with whom he might be driving. At Hughenden there was no provision for field-sports—no gamekeepers, no hunters—nor did Lord Beaconsfield even in her ladyship's lifetime keep much company. His dinner-parties were usually limited to guests staying in the house, and, as that is a small one, they generally corresponded to his definition of an agreeable number —"not less than the Graces and not more than the Muses." He retired to Hughenden for repose, and did not care to carry London with him. But here, as may be supposed, he was seen to the greatest advantage, and here, if anywhere, he seemed thoroughly to enjoy himself. But as Hughenden was the one place in England to visit him, so the library was the one place at Hughenden in which it was the most interesting to observe him. He knew every book upon the shelves, and the exact spot on which each stood, though he had not touched it for years. "There is an interesting book somewhere here which I should like you to look at," he would observe to a visitor, and then, notwithstanding his extreme near-sightedness, amounting almost to blindness, he seldom failed to walk straight up to the book he wanted and put his fingers on it at once. Then he would take it forth tenderly, holding it open in the palm of his hand, almost touching his face, and turning over the leaves "with a delicate Oriental forefinger," never using his thumb if he could possibly avoid it. The library will always remain a memento of some of its late owner's peculiarities. Here on the red carpet from hour to hour would he pace backward and forward, leaning on his secretary's arm, discussing past events and maturing his future plans. He seldom sat down to think; standing or walking was his favorite position for meditation, and over the floor of his library he seemed to glide, rarely if ever lifting either foot from the ground.

Lord Beaconsfield was rather an early riser; he was usually about by eight o'clock, and ready for the work of the day between nine and ten. His study was a small room on an upper floor, looking out upon the lawn and woods at the back of the house, and furnished with great simplicity. Here, when not actually writing or reading, he loved to lie in slippered ease upon the sofa, conversing with any one who was deemed worthy of admission. His mornings were passed in this manner, either working or talking in his study or pacing the library. In the afternoon he usually went out of doors, his favorite resort being a seat put up for him in the "German forest," where he would sit placidly contemplating the beech trees and the birds till it was time to return to dinner. Even when he was minister the messengers from Downing Street were usually got rid of by four o'clock, when the old statesman would hurry out to refresh himself with those sights and sounds of nature which he loved so well. Among other things, he was a great admirer of peacocks, and the beautiful birds to be seen at Hughenden during his lifetime were a present from his old friend Sir Philip Rose, who studied his wants and tastes with constant assiduity. Perhaps one of his most characteristic traits was his devotion to the sun. A dull, sunless day made him miserable, and when walking on the terrace in front of Hughenden he always turned round at the point where the shadow fell. He would never wonder, he said, at sun-worship. The sun was the source of life, light, and heat, and equally essential to both the necessities and the pleasures of existence. In this susceptibility we doubtless see the influence of race, as also perhaps in the special sympathy which Lord Beaconsfield always manifested with physical suffering. Nothing gave him greater happiness than to alleviate it; and next to this was the pleasure which he derived from assisting persons really in want. None ever appealed to him in vain for subscriptions to a charity of which these were the objects.

Lord Beaconsfield's public life was of so unprecedented and marvellous a character, while his private life was so much withdrawn from observation, his historical theories of so bold and novel a description, and his innermost political convictions supposed at least to be shrouded in so much mystery, that men involuntarily regarded him to the last with a kind of wonder, uncertain if they rightly comprehended his real nature and idiosyncrasy. It takes time to understand a genius like Lord Beaconsfield's, and it may well be that posterity will know him better than we do. In the mean time, we may all do honor to qualities which those who had the best opportunities of judging are unanimous in ascribing to him—infinite kindness of heart, staunch fidelity in his friendships, equal magnanimity in his enmities, and a pure and unaffected love of nature, which cheered him to the end amid all the bereavements and disappointments which marked his closing years. (T. E. K.)

BEAK OF BIRDS. See BILL.

BEALE, LIONEL SMITH, F. R. S., an English physician and author, was born in London in 1828. He was educated at King's College School, studied medicine, and was elected a fellow of the College of Physicians in 1859. He is a member of many medical and scientific societies, British and foreign. He has been a frequent contributor to the *Lancet*, the *Medical Times and Gazette*, the *Medical and Chirurgical Review*, and the *Microscopical Journal*. He is also editor of the *Archives of Medicine*. Among his published works are—*The Microscope in its Application to Practical Medicine*, *How to Work with the Microscope*, *The Structure of the Tissues of the Body*, *Protoplasm, or Life, Matter and Mind*, *Disease Germs*, *Life Theories, their Influence on Religious Thought* (1871), *The Mystery of Life* (1871), *The Anatomy of the Liver*. In company with Dr. Todd and Mr. Bowman he prepared *The Physiological Anatomy and Physiology of Man*. Special memoirs by Dr. Beale have been published in the *Philosophical Transactions* and in the *Proceedings of the Royal Society*. He has opposed what he regards as materialistic tendencies in modern scientific teaching.

BEARD, GEORGE MILLER (1839–1883), an American physician and author, was born at Montville, Conn., May 8, 1839. His father was a Congregational clergyman and his grandfather a physician. After studying at Phillips Academy, Andover, Mass., he spent some time teaching, and then entered Yale College, where he graduated in 1862. In his undergraduate course he was one of the editors of the *Yale Literary Magazine*. After a year's study in the medical department of the same college he was made acting assistant surgeon in the U. S. navy, and spent eighteen months in the Western Gulf squadron. In 1866 he received his degree of M. D. at the College of Physicians and Surgeons in New York, and settled in that city. He devoted himself especially to diseases of the nervous system, and in 1868 lectured on that branch of medical science in the University of New York. From 1873 to 1876 he was connected with the Demilt Dispensary, and during this time began the systematic study of psychology and pathology of popular delusions, including animal magnetism, clairvoyance, spiritualism, and mind-reading. He died at New York, Jan. 23, 1883. His writings include numerous pamphlets, papers, and monographs, chiefly on the medical use of electricity, nervous diseases, trance, and insanity. Many of these were based on original research, and have reference to conditions that are more or less peculiar to American climate and habits of living. His most important books are—*The Medical Use of Electricity* (1867; enlarged ed. 1875), *Our Home Physician* (1869), *Eating and Drinking* (1871), *Stimulants and Narcotics* (1871), *Hay-Fever or Summer Catarrh* (1876), *Nervous Exhaustion, Neurasthenia* (1880), *Sea-Sickness* (1881), *American Nervousness* (1881), *Medical Education and the Medical Profession in Europe* (1882).

BEARD, William H., an American artist, was born at Painesville, Ohio, April 13, 1825. He at first employed himself with portrait-painting, and pursued this branch of art for a number of years. In 1850 he went to Buffalo, where he resided until 1857, when he visited Europe for purposes of study and artistic practice. In 1860 he removed to New York, where he has since resided. Since he has been in New York, Beard has devoted himself mainly to the delineation of humorous and satirical subjects in which animals figure as the actors. He has painted a great number of pictures of this class, among the most celebrated of which are—Bears on a Bender, The Court of Justice, The Astronomer, The Watchers, Bears' Dance, Raining Cats and Dogs, The Bar-room Politicians, Pets on a Spree, Old-time Club Life, The Wreckers, Lo, the Poor Indian, Worn Out, The Dancing-lesson, and The March of Silenus. Beard's vein of humor is not very refined, but it is genuine enough, and he succeeds in putting an immense amount of expression into his brutes masquerading as humanity.

BEARDSTOWN, the county-seat of Cass co., Ill., is on the E. bank of the Illinois River, 112 miles N. of St. Louis. It is on the St. Louis and Rock Island division of the Chicago, Burlington, and Quincy Railroad, and is the terminus of the Springfield division of the Ohio and Mississippi Railroad. The former road has here a fine bridge which cost $300,000. Beardstown has three hotels, two banks, seven churches, a graded school with handsome brick building, and three weekly newspapers (one German). Besides railroad car-works, it has a foundry, woollen-mill, flour-mill, two saw-mills, a large wagon-factory, a distillery, and a brewery. In this town there are celebrated lithia springs. Beardstown was founded in 1824 by Thomas Beard. Population, 3135.

BEAUFORT, a port of entry and county-seat of Carteret co., N. C., is on an inlet 3 miles from the Atlantic Ocean and 11 miles N. W. of Cape Lookout. The harbor is safe, readily admitting vessels drawing 20 feet of water, and is defended by Fort Macon. On the W. side of the harbor is the smaller town of Morehead City. Beaufort is connected with the through route of Southern travel by the Midland North Carolina Railroad, and its harbor is connected with the Neuse River by the Beaufort and New Berne Canal, 100 feet wide and 10 feet deep. It has one of the oldest custom-houses in the United States, three hotels, several boarding-houses, five churches (two colored), and schools. It is a favorite summer resort, and has a large trade in fish, both salt and fresh, oysters, and clams. In the vicinity are several saw-mills and large menhaden fish-oil factories. It was originally chartered under the name of Fishtown. Population, 2009.

BEAUFORT (pronounced Būfort), the county-seat of Beaufort co., S. C., is on Port Royal Island, 80 miles from Charleston by water, but less than 60 miles W. S. W. in a direct line. It is about 15 miles from the Atlantic Ocean, on an inlet called Port Royal River, and has a good harbor, admitting vessels of 15 feet draught. An attempt at settlement was made on this island by the French in 1562, but the first permanent settlement was made in 1680 by the English. The town was incorporated in 1803. In the War of the Rebellion it was captured and occupied by the United States forces Dec. 6, 1861, and used as a base of naval operations on the South Atlantic coast. Beaufort has a court-house, town-hall, two hotels, a bank, a weekly newspaper, eight churches, and three schools. Sea-island cotton is raised in the vicinity, and there are three cotton-gins in the town. The property is valued at $500,000; the public debt is $5000, and the expenses for the year 1881 were $8000. Most of the inhabitants are negroes; many of the whites are from the North. Population, 2549.

BEAUMONT, William (1785–1853), an American physician noted for his discoveries respecting the laws of digestion, was born at Lebanon, Conn., in 1785. He studied medicine at St. Alban's, Vt., and in 1812 was appointed assistant surgeon in the United States army. In June, 1822, while he was stationed at Michilimackinac, Mich., he was called upon to treat the case which has rendered him famous. Alexis St. Martin, a Canadian voyageur, eighteen years of age, had been accidentally shot, receiving in his left side, from a distance of three or four feet, the entire charge of a musket, which carried with it portions of his clothing, fractured two ribs, lacerated the lungs, and entered the stomach. By skilful treatment St. Martin within a year was restored to health, though the wound left an aperture about two and a half inches in diameter, through which the processes of digestion could be observed and experimented upon. Dr. Beaumont availed himself of this remarkable case to make a series of experiments on the operations and secretions of the stomach. The results of these observations were first published in 1833, and were received both in Europe and America as a most valuable contribution to medical science. Although the existence and some of the properties of the gastric juice had previously been inferred, Dr. Beaumont was the first to obtain it from the body, and to show that it had the power, at proper temperatures, of liquefying and dissolving articles of food. In 1837 he retired from the army and settled at St. Louis, where he had successful practice. At intervals he resumed his experiments upon St. Martin, and in 1847 published additional observations. He died at St. Louis, April 25, 1853. Further experiments were made upon St. Martin by Dr. F. Gurney Smith, and published in the *Philadelphia Medical Examiner*, September, 1858. St. Martin died in 1881, aged seventy-seven.

BEAUMONT de la BONNIÈRE, Gustave-Auguste (1802–1866), a French statesman, born at Beaumont-la-Châtre (Sarthe), Feb. 16, 1802. He was a grandson of La Fayette. Entering the magistracy in 1824, he became royal solicitor at Versailles and Paris. In 1831 he was sent to America, in company with De Tocqueville, to study the penitentiary system of the United States. The results of this visit appeared in works on the penitentiary system of the United States (1833) and on the institution of slavery in that country (1835). After his return in 1832 he refused to take part in some legal proceedings obnoxious to him, and was in consequence dismissed from his public positions. Elected deputy of Sarthe in 1839, he retained his seat until 1852, voting usually with the Left Centre. He was in the Chamber an earnest advocate of the extension of the French railway system, and also of the colonization of Algiers. He opposed electoral corruption, and had a bill passed in 1842 for an inquiry into the "abuse of influences." After the Revolution of 1848 he became a moderate Republican member of the Constituent Assembly, was elected its vice-president, and was sent as ambassador to London in Aug., 1848. At a later date he was sent on an embassy to Vienna. He opposed the *coup d'état* of Dec., 1851, and was with other deputies imprisoned in Mont Valérien. On regaining his liberty he withdrew to his patrimonial estates, which he left afterwards only to take part in the work of the Institute, of which he was a member, having been elected to the Academy of Moral and Political Science in 1841. He died at Tours, March 2, 1866. Besides his works already mentioned referring to the United States, M. Beaumont was the author of *L'Irlande sociale, politique, et religieuse* (2 vols., 1837)

BEAUREGARD, Pierre Gustave Toutant de, a general in the Confederate army, was born in the parish of St. Bernard, 20 miles below New Orleans, La., May 23, 1818. He entered West Point in 1834, graduated four years later second in his class, and was appointed second lieutenant in the corps of engineers. After remaining at West Point a few months as instructor of engineering and artillery, with the rank of lieutenant of engineers, he was transferred to Newport, R. I., as assistant to Col. Totten. In 1840 he was ordered to New Orleans to take charge of the Louisiana fortifications. Beauregard served with great distinction in the Mexican War. At the siege of Vera Cruz he located three out of the five principal batteries which reduced that city. He was at the battles of Cerro Gordo, Contreras, and Churubusco; he led the party which stormed the heights of Chapultepec, and was one of the first to enter the castle. He was three times complimented by Gen. Scott, and was brevetted captain for gallantry at Contreras, and major for valuable services and bravery at Chapultepec and at the Belen Gate in the attack upon the city of Mexico.

At the close of the Mexican War, Major Beauregard took command of the fortifications of Louisiana, including Forts St. Philip and Jackson. In 1851 he also superintended the building of the U. S. custom-house, the marine hospital, and the repairs of all public buildings in New Orleans. In 1860, Beauregard was appointed superintendent at West Point, with the rank of colonel, but resigned when in January, 1861, Louisiana seceded from the Union. He was then appointed brigadier-general in the Confederate army, and sent to Charleston to lay siege to Fort Sumter, the bombardment of which was commenced on April 12, 1861, and the fort surrendered April 14. A few weeks after this he was ordered to Richmond to organize the Confederate Army of the Potomac. After consulting with Pres. Davis and Gen. Lee, a defensive campaign was decided upon, and the army of Beauregard was concentrated at Manassas Gap. After the battles of Bull Run and Manassas (July 18th and 20th) the Confederate Congress, in acknowledgment of his services, conferred on him the rank of general. Early in January, 1862, Gen. Beauregard was transferred to the department of the Mississippi, and on February 3d he went to Nashville to strengthen the defences of that city. On March 5th he assumed command of the Confederate forces in the Valley of the Mississippi, with his headquarters at Jackson. It was determined to attack the Federal army, then at Pittsburg Landing under Gen. Grant. On April 6th the Union forces were driven back to the shelter of their gun-boats. After the fall of Gen. A. S. Johnston the command of the Confederates devolved on Gen. Beauregard. The next day (April 7th), the Federal army having been reinforced by the arrival of Gen. Buell's command, the battle was renewed, and after six hours of hard fighting Beauregard withdrew his army to Corinth. Subsequently he was relieved of his command. But when Charleston was threatened by a powerful land and water attack in the summer of 1862, Beauregard was assigned to the defence of that city. In April, 1864, he was called from Charleston to the defence of Petersburg, Va., and he attacked and defeated Gen. B. F. Butler at Drury's Bluff on May 16, 1864. In November, 1864, he was assigned to the military division of the South, and at end of the war he surrendered at Greensboro', N. C., in April, 1865.

In November, 1865, he became president of the New Orleans and Jackson Railroad Company, which position he held until 1870. In 1878 he was appointed adjutant-general of Louisiana. (E. L. D.)

See Vol. III. p. 410 Am. ed. (p. 475 Edin. ed.).

BEAVER (A.-S. *befer*; Mid. Eng. *bever*; Lat. *fiber*), an aquatic rodent quadruped, *Castor fiber*, the sole living representative of its genus and of the family *Castoridæ*. Several fossil genera (*Eucastor*, *Trogonotherium*, etc.), were more or less closely related to the living beaver, and all are commonly referred to the family *Castoridæ*. They occur in the Tertiaries of Europe and North America. *Castor* itself is found in the same formations and in the Quaternary of North America. The family belongs to the sciuromorphic series of *Rodentia*, and, like *Haplodon*, is quite closely related to the *Sciuridæ*. The genus *Castor* differs from all the *Sciuridæ* in lacking post-orbital processes, in the persistently growing molars, single-rooted, with open pulp-cavities and complicated foldings of the enamel sheet; the molar series are convergent anteriorly instead of parallel; the palate is arched, not plane; the lower jaw is extremely massive, with extensive symphysis; the incisors are highly developed, and the whole manducatory apparatus, osseous as well as dentinal, exhibits a perfection of rodent characters. The incisors are one pair above and below, the grinders four above and below. In their highly aquatic mode of life the beavers are related to the muskrats (*Fiber*) and some other *Arvicolinæ*.

The body is stout and thick-set, especially behind; the tail is broadly oval, flat, and scaly; the feet are four-toed, the anterior small, the hinder large, palmate, with a double claw on the second toe. The palms and soles are naked. The ears are small and low; the eyes small. The mammæ are four. The fur is extremely thick, consisting of glistening over-hairs and very copious under-fur. The color is reddish-brown above, grayer below, but extremely variable in different individuals at different ages and seasons, sometimes quite blackish, not rarely pied or albino. The size varies within wide limits, the beaver being apparently one of those animals which grow slowly for an indefinite period after reaching maturity. The usual length is from two to two and a half feet, with a tail of about ten inches. A well-grown beaver weighs about forty pounds, but some have been taken up to sixty pounds, and a weight of sixty-three pounds is recorded in one case.

A long argument has been maintained respecting the specific identity or distinctness of the American and European beavers. Specific distinction is said to have been first suggested by Oken in 1816, and weight of authority has preponderated on that side of the question. The American was first named as distinct by Kuhl in 1820. The Russian naturalist Brandt produced in 1855 an elaborate memoir to show their distinctness on the grounds of certain cranial differences and others of the castoreum. Baird in 1858 took the same view, mainly on account of the larger size of the American animal, as noted by F. Cuvier in 1825. In 1868, Morgan and Ely reviewed the subject in a special work, concluding the two to be varieties of one species. This is the view finally adopted in 1877 by J. A. Allen, the latest and most scrupulous authority upon the subject. Allen formulates the differences in the following manner (*Monogr. N. Am. Rodentia*, *Castoridæ*, p. 444):

Castor fiber, *var. fiber*, European beaver. Dorsal surface of the interorbital region generally as broad as, or broader than, long; nasals extending backward beyond the posterior border of the anterior orbital process; basilar cavity deep and large; bullæ placed more anteriorly, etc.

Castor fiber, *var. Canadensis*, American beaver. Dorsal surface of the interorbital region generally longer than broad; nasals generally not reaching beyond the middle of the anterior orbital process; basilar cavity comparatively shallow, etc.

The American beaver has been found fossil with *Castoroides Ohioensis*, and thence to the deposits in bone-caves; geographically, in New York, Pennsylvania, New Jersey, Virginia, North Carolina, and Tennessee. Its living range was formerly more extended than it is now, embracing North America at large—north to the limit of trees, south to North Florida and some distance into Mexico. At present, however, in the United States east of the Mississippi it is rare and isolated, though known to linger in unsettled regions of Maine, New York, Virginia, and doubtless elsewhere. It was lately (1876) reported as "abundant" in some parts of Virginia. It is still common in suitable places in the West. I frequently saw it in Arizona twenty years ago, and within a very few years it abounded on the head-waters of the Platte in Colorado, as well as on the waters of the Upper Missouri.

Fossil beavers of North America of other genera are *Eucastor tortus* and *Steneofiber Nebrascensis*. (E. C.)

BEAVER DAM, a city of Dodge co., Wis., is on a creek and lake of the same name, 63 miles W. N. W. of Milwaukee, on the Chicago, Milwaukee, and St. Paul Railroad. It has a fine city-hall, three hotels, a national bank, two weekly newspapers, fourteen churches, and a high school and other schools with good buildings, and is the seat of Wayland University. It has a foundry, two woollen-mills, a cotton-mill, grist-mills, two breweries, a tannery, sash-and-blind factory, a planing-mill, and minor industries. It is a handsome town, and has a medicinal spring, in connection with which a hotel and park have been established. It was settled in 1841, and incorporated in 1856. Its property is valued at $2,000,000, but is assessed at one-third this valuation. Its public debt is $7500, and the yearly public expenses of all kinds are $21,000. Population, about one-half of American birth, 3416.

BEAVER FALLS, a town of Beaver co., Pa., is on the W. bank of Beaver River, 3 miles above the Ohio and 32 miles N. W. of Pittsburg, on the Pittsburg and Lake Erie Railroad and the Pittsburg, Fort Wayne, and Chicago Railroad, which are here connected by a transfer track two miles long. A railroad bridge connects the town with New Brighton. The town has a fine water-power, and contains a rolling-mill, steel-mill, machine-foundry, brass-foundry, flour-mill, car-works, cutlery, a barbed-wire fence factory, three planing-mills, two potteries, two stove-foundries, brick-yards, and manufactures of shovels, files, axes, hoes, saws, glass, and paper. It also contains a college, good public schools, eight churches, two banks, two hotels, and has two weekly newspapers. Coal abounds in the vicinity, and three wells of natural gas are utilized in the factories. Most of the industrial works are owned and controlled by the Harmony Society of Economy. The town was incorporated in 1867. Population, 5104.

BECK, JOHANN TOBIAS (1804–1878), an eminent German theologian, was born at Balingen, in Würtemberg, Feb. 22, 1804. He studied theology at Tübingen 1822–26, and after nine years of service as Lutheran pastor in Würtemberg he accepted in 1836 a call to an extraordinary professorship of theology in Basel, whence he was recalled to Tübingen in 1843 as ordinary professor of theology and morning preacher in the university church. The period of his activity in Tübingen coincided in good part with that of Prof. F. C. Baur and the so-called "Tübingen school" of negative criticism. Beck's influence was in a very different direction, although he abstained from direct controversy with his colleagues and others of like principles. Both by his sermons and from the chair he labored with remarkable success in creating a school of purely biblical theologians, teaching his disciples to lay aside all prepossessions except a regard for the Bible as the revelation of God's will, and to develop their theology directly from the sacred text. He thus developed a system which we may call biblical pietism, with serious differences from Church doctrines as regards the vicarious atonement and other points. His indifference to the ecclesiastical confessions of faith and to the historical development of doctrines, his refusal to see in the existing order of Church and State any practical realization of God's kingdom, and his expectation of their overthrow by the second coming of Christ, all exposed him to severe criticism from the orthodox side. Fr. Libetrat, in his *Beck und seine Stellung zur Kirche* (1857–58), and J. H. Ebrard, in his *Sola Wissenschaftliche Beleuchtung von J. T. Beck's Rechtfertigungslehre* (1871), are representatives of this criticism, the latter in much the better temper. In spite of it, the *Beckianer* are a large body among the devout and earnest pastors of South Germany.

In 1837, Beck began his literary career by publishing the first volume of his *Christian Discourse* (*Christliche Reden*), of which the sixth volume appeared in 1870; they are reckoned among the best German sermons, and are simple, devout, and searching. Next to these may be named his *Introduction to the System of Christian Doctrine* (*Einleitung in das System der Christlichen Lehre*), 1838, 1870; his *Outline of Biblical Psychology* (*Umrisse der biblische Seelenlehre*), 1843, 1862, 1871, and English translation, Edinburgh, 187–; his *Birth of the Christian Life, its Nature and its Law* (*Die Geburt des Christlichen Lebens, sein Wesen und sein Gesetz*), 1839–72; his *Science of Christian Doctrine* (*Christliche Lehrwissenschaft*), 1841; and his *Guide to Christian Doctrine for Church, School, and Home* (*Leitfaden des Christlichen Glaubenslehre für Kirche, Schule, und Haus*), 1862, 1869. His *Scriptural Thoughts for Christian Life and the Clerical Office* (*Gedanken aus und nach der Schrift für Christlichen Leben und geistliche Amt*), 1859 and 1878, are drawn from the letters of advice written to his many disciples, who turned to him for counsel in the difficulties of their ministry. He died Dec. 28, 1878. "In him," says a not very friendly critic, "Germany lost her pithiest and most original theologian."

BECKER, CARL, a German artist, was born at Berlin, Dec. 18, 1820. He studied at the Berlin Academy, and received instruction from Von Klöber, Heinrich Hess, and Cornelius. As the pensioner of the Berlin Academy he visited Paris and Rome. Many of Becker's compositions have historical episodes for their subjects, as, for example, Charles V. being Entertained by Fugger, The Emperor Maximilian crowning Ulrich von Hutten at Augsburg, and the Emperor Maximilian receiving the Venetian Embassy; but he is not properly an historical painter, for the reason that his themes, whether from history or the works of Shakespeare, are chosen rather for the opportunities they afford of making combinations of elaborate architecture, rich stuffs, and other accessories than for their dramatic and poetical qualities. Becker has painted a very great number of pictures, some with definite subjects, and some which might as well be called by one name as by another. They are painted broadly and with a free hand, and are generally rich and effective combinations of color. These pictures, however, are executed in accordance with an entirely artificial scheme, and only remotely suggest nature and natural effects, without supplying such lacking with any high imaginative qualities. Becker is president of the Berlin Academy, and is a member of the Vienna Academy and of the Royal Society of Letters and Fine Arts of Belgium. He is an officer of the order of Leopold, and he has been awarded a number of medals. (W. J. C., JR.)

BECKER, CARL FERDINAND (1804–1877), was born at Leipsic, July 17, 1804. He was a pupil of Schicht and Schneider, and when only fourteen years of age appeared in public as a pianist. Becoming an earnest organ-student, he retired from the concert-room, and eventually became organist of the Nicolai-Kirche in Leipsic, and combined with Mendelssohn to found the Conservatorium of Music in that city. Becker belongs to the modern school of musicians in being connected with literature and science rather than being wholly occupied and absorbed by musical performance and composition. In 1836, Becker published the *Systematisch-Chronologische Darstellung der Musik-Literatur*, and in 1839 a valuable appendix thereto. In 1840 another important work was completed by him, entitled *Hausmusik in Deutschland in 16ten, 17ten, 18ten jahrh.*, and *Die Tonwerke des 16ten und 17ten jahrh.* In 1847 a catalogue of music printed in this period came from his pen. He died at Leipsic, Oct. 26, 1877. Becker's manuscripts which were all bequeathed to the city of Leipsic, testify to his mental abilities and high rank as a didactic musician. (S. A. P.)

BEDELL, Gregory Thurston, D. D., bishop of the Protestant Episcopal Church, son of Rev. Dr. G. T. Bedell, was born at Hudson, N. Y., Aug. 27, 1817. He was educated at Flushing Institute by Dr. Muhlenberg, and graduated at Bristol College, Pa.; studied theology at Alexandria, Va., and was ordained in 1840 in St. Andrew's Church, Philadelphia. He had charge of a church at West Chester, Pa., and was rector of the Church of the Ascension, New York, from 1843 to 1859. He was then consecrated assistant bishop of Ohio, and on the death of Bishop McIlvaine in 1873 succeeded to the bishopric. He became professor of pastoral theology in the theological seminary at Gambier in 1880. He has been popular as an evangelical preacher, and many of his sermons have been published in Scotland and England as well as in America. He has republished his father's book, *Pay thy Vows*, with additions under the title *Renunciation*. His other publications comprise lectures on pastoral divinity under the title of *The Pastor*, reminiscences of the second Lambeth Conference under the title *Canterbury Pilgrimage*, *Interviews with the Armenian Patriarch at Jerusalem*, a *Translation of the Coptic Liturgy*, and *Ecclesia Docens*.

BEDELL, Gregory Townsend, D.D. (1793–1834), an eminent Episcopal clergyman, was born on Staten Island, N. Y., Oct. 28, 1793. His mother was a sister of Bishop Moore of Virginia. After his father's failure in business his sisters made great sacrifices to secure for him a liberal education. He graduated at Columbia College in 1811, and was ordained by Bishop Hobart Nov. 4, 1814. He spent some time in travelling in the South, where his graceful elocution and finished style made him a favorite preacher. Yet to be near his father's family he refused calls to a distance, and became rector at Hudson, N. Y., in 1815. On recommendation of Bishop Hobart he was called to Fayetteville, N. C., in 1818, where he remained five years, and showed himself ready to co-operate with other denominations in good works. Becoming convinced that a Southern climate was unfavorable to his health, in 1823 he accepted a call to the rectorship of St. Andrew's Church, Philadelphia, in which position he remained till his death. For several years he was an invalid, yet he continued to labor apparently beyond his strength, with an ever-increasing reputation as a master of pulpit eloquence. He died at Baltimore, Aug. 30, 1834, while on his way home from a summer resort. He was a zealous promoter of religious literature, and took an active part in the work of the American Sunday-School Union. He composed several sacred poems, and also musical compositions which have been widely used in churches. Among his works are *Ezekiel's Vision*, *Onward; or, Christian Progression*, *Pay Thy Vows*, *Way-Marks*, *Bible Studies*, 1829, *Religious Souvenir*, 1834. Rev. Dr. S. H. Tyng published a memoir of Dr. Bedell, with thirty of his sermons, in 1836.

BEDFORD, the county-seat of Lawrence co., Ind., is 4 miles N. of West Fork of White River, 75 miles N. W. of Louisville, on the Louisville, New Albany, and Chicago Railroad. It is also the terminus of a narrow-gauge railroad, about 40 miles long, to Switz City. It has a fine court-house which cost $80,000, a town-hall, opera-house, six hotels, a bank, four weekly newspapers, five churches, and a graded school. It has a woollen-mill, two saw-mills, two flour-mills, two planing-mills, a spoke-factory, and a cigar-factory, and there are limestone-quarries in the vicinity. It was settled about 1825, and incorporated in 1870. Population, chiefly of American birth, 2198.

BEDFORD, the county-seat of Taylor co., Iowa, is on 102 River, 8 miles N. of the Missouri line and 50 miles N. of St. Joseph, Mo., on the Chicago, Burlington, and Quincy Railroad. It has a court-house, a park, two hotels, two banks, four weekly newspapers, four churches, and a high school and other schools. It has flour-mills and manufactures of furniture and cigars. It was settled in 1855, and is incorporated as a city of the second class. Population, 1763.

BEDFORD, the county-seat of Bedford co., Pa., is on the Raystown branch of the Juniata River and on the Bedford division of the Pennsylvania Railroad, 37 miles N. N. E. of Cumberland, Md., and 53 miles S. W. of Huntingdon, Pa., with which it is connected by the Huntingdon and Broad Top Railroad. It is pleasantly situated in a valley, one mile from Bedford Springs, a fashionable summer resort. It has seven churches, three weekly newspapers, a bank, a fine public schoolhouse, and a foundry. Population, 2011. The Bedford Springs contain carbonic acid, sulphur, lime, soda, etc., and some of them are chalybeate.

BEECHER, Catharine Esther (1800–1878), daughter of Lyman Beecher and Roxana Foote, was born at East Hampton, Long Island, Sept. 6, 1800. She was engaged when still young to Prof. Fisher of Yale College, who perished by shipwreck off the coast of Ireland while on a voyage to Europe; she never married. From 1822 to 1832 she was the principal and proprietor of a school in Hartford, Conn., during which time she prepared some elementary books on arithmetic and mental and moral philosophy. In 1832 she accompanied her father, on his acceptance of the presidency of Lane Seminary, to Cincinnati, where she opened a female seminary, which she two years later discontinued on account of ill-health. She devoted herself thereafter to pushing forward her peculiar views respecting woman's education, for this purpose writing much for the periodical press and organizing various efforts for training teachers and sending them into the new States and Territories. Time has sifted her theories respecting female education, but very much of the present advanced state of schools and colleges for women in this country is due to her energetic efforts. She died May 12, 1878, at Elmira, N. Y., at the home of her brother Thomas. Her works, all published in New York, are—*An Appeal to the People*, *Common Sense applied to Religion*, *Letters to the People*, *Physiology and Calisthenics*, *The Housekeeper and Healthkeeper*, *The Religious Training of Children*, and *Educational Reminiscences and Suggestions*. (L. A.)

BEECHER, Charles, son of Dr. Lyman Beecher, born at Litchfield, Conn., Oct. 7, 1815; fitted for college at Boston Latin School and Groton Academy; graduated from Bowdoin College in the class of 1833; studied theology at Lane Seminary in Cincinnati in 1837; became organist of La Fayette Square Church, Dr. Breckenbridge, New Orleans, La., 1838; ordained at Second Presbyterian Church in Fort Wayne, Ind., 1844; pastor of First Congregational Church, Newark, N. J., 1851; pastor of First Congregational Church, Georgetown, Mass., 1857, from which he withdrew in 1881. In 1870 he went to Florida, and bought an orange-grove at Newport, 18 miles south of Tallahassee, where most of his time has since been passed.

His works are as follows: *Bible Sufficient Creed* (Ft. Wayne, 1844); *Incarnation* (New York, 1849); *Review of Spiritual Manifestations* (New York, 1853); *David and his Throne* (New York, 1855); *Plymouth Collection of Music* (New York, 1855); *Autobiography and Correspondence of Lyman Beecher* (New York, 1864); *Redeemer and Redeemed* (Boston, 1864); *Spiritual Manifestations* (Boston, 1879); *Eden Tableau* (Boston, 1880). He is at present (1883) engaged in making an Arabic lexicon, a concordance for the Psalms, and translations from the German. (L. A.)

BEECHER, Edward, eldest son of Rev. Lyman Beecher and Roxana Foote, was born at East Hampton, L. I., Aug. 27, 1803; moved to Litchfield, Conn., in 1810; fitted for college at South Farms Academy (Litchfield); Berkeley scholar and valedictorian of the class of 1822 of Yale; taught in Hartford, Conn., for two years after graduating; then for less than a year was a member of Andover Theological Seminary; tutor in Yale College 1825–26; pastor of Park Street Church, Boston, for four years, beginning in 1826; president of Illinois College, Jacksonville, fourteen years, commencing in the fall of 1830; pastor of Salem Street Church, Boston, from the year 1844, about twelve years; pastor of the First Congregational Church of Galesburg, Ill., 1855–70, since which time he has resided in Brooklyn, N. Y., preaching occasionally. In 1829 he married Isabella P. Jones of Wiscasset, Me., still living. In 1841, Marietta College conferred on Mr. Beecher the degree of D. D. His published writings are—*On the Kingdom of God; A History of the Mob at Alton* (1838); *The Papal Conspiracy* (1855); *Import and Modes of Baptism* (1850); *The Conflict of Ages* (1854); *The Concord of Ages* (1854); *The History of the Scriptural Doctrine of Retribution; Six Sermons on the Promotion of Holiness; Plea for Illinois College;* and *Anti-Slavery Principles.* For about four years from its beginning, Dr. Beecher was senior editor of the *Congregationalist* in Boston. He has also written various articles for the *Biblical Repository*, the *Bibliotheca Sacra*, the *Independent*, and *The Christian Union*, which would make three or four large volumes. His chief contributions to theology, however, are his work on *Retribution*, a very scholarly and comprehensive survey of the doctrine of future punishment as historically held by the Church, and his two volumes on the *Conflict of Ages* and the *Concord of Ages*, in which he propounds and maintains the opinion that this life is a special probation for spirits who have fallen into sin in a pre-existent state, and applies it in accounting for the origin of evil and in vindicating God's dealings with the human race. (L. A.)

BEECHER, GEORGE (1809–1843), third son of Rev. Lyman and Roxana Beecher, born at East Hampton, L. I., in 1809. Graduated from Yale College, and studied theology at New Haven. On the removal of his father to Lane Seminary he accompanied him, and settled soon after at Batavia, Ohio. He labored here faithfully for four years. His studies had been interrupted by ill-health, and he devoted a year to reading, hearing lectures, and studying at Lane Seminary. About this time he was married to Miss Sarah L. Buckingham of Putnam, Ohio; was settled at Rochester for several years, and then moved to Chillicothe, Ohio, where he took charge of a church. On July 1, 1843, he died from the effects of the accidental discharge of a gun. He was a devoted Christian, an able revival preacher, and was loved by all who knew him. (L. A.)

BEECHER, HENRY WARD. The Beecher name in America dates back to the settlement of New Haven in 1638, when a widow, Hannah Beecher, and Andrew Ward came over from England with Davenport. Lyman Beecher and Roxana Foote, the descendants of these two pioneers, were married Sept. 19, 1799, and to them was born in Litchfield, Conn., June 24, 1813, Henry Ward. He was one of a family of thirteen children, two of whom died in infancy and eleven grew to man's estate. The maintenance and education of the family must be eked out of the father's salary of $800 a year. The share which fell to each child's portion was therefore not a large one, and a habit of self-reliance and self-support was early developed in the Beecher children. This sense of individual care and judgment was augmented by the condition of children in those days. Little or no attention was paid to them beyond the strict supervision of their moral and mental training as inculcated in the Catechism and the country schoolhouse. The let-alone system prevailed, and they were allowed to do as they chose, their plays and amusements being such as grew out of childish inventions and their relationship with the spirit of nature. Henry Ward's boyhood was innocent of the child's literature, the Sunday-school gatherings, the gifts and mementoes of birthdays, Christmases, and New Years, the days of fêtes and festivals, that color the present era of childhood. Heavy and strict duties in the care of house and garden, barn and woodshed, were his boyish occupations, but cheerless and hard as this experience was at times, it worked to his advantage in the foundation of a robust health, a muscular body, and a vigorous and healthy nervous system. He was merry, bright, and affectionate as a child, with a disposition inclined somewhat to dreaminess and wonder, and a mind kept pure and unsullied by the lessons he drew unconsciously from the fields, the woods, the mountains, and all the silent agents of nature that environed his home.

His own mother died when he was but three years old, and her love and tender care were in a measure replaced a year later by the second marriage of his father. The new mother had been as a girl distinguished for the brilliancy of her social acquirements, which, at the time of her marriage, she had through conversion, under the influence of Dr. Edward Parker, grown to disesteem, and had become in all sincerity a devotee to an unyielding conscience, an inflexible, rigorous, and sombre religion. Under the influence of such a nature the boy grew up, at once inspired and repressed. His earliest learning was acquired at the village and district schools and the young ladies' seminary at Hartford presided over by his eldest sister. At each of these institutions he evinced a greater capacity for mischief than for learning. Subsequently, on the removal of the family to Boston, he entered the Boston Latin School, and after that Mount Pleasant School in Amherst, Mass., where he conquered the vocal difficulties that had thickened his speech up to this time. He entered Amherst College in 1830, and gained among his fellow-students a reputation for remarkable ability. His religious experience in college was of a deep and abiding nature, and confidence confirmed his desire to become a minister, so that on graduating in 1834 he joined his father, who two years previously had become president of Lane Theological Seminary in Cincinnati, Ohio. After a course of study here, and a short season of editorship of the *Cincinnati Journal*, he began his ministry in 1837 at Lawrenceburg, Ind., two years afterward accepting a call to Indianapolis, 1839, whence he removed after a fruitful service of some years to take charge, Oct. 16, 1847, of Plymouth Congregational Church, Brooklyn, N. Y., his present pastorate. Mr. Beecher's power and originality as a preacher have acquired such widespread fame that they have overshadowed his abilities and services, scarcely less notable, in the fields of the lecturer, orator, reformer, journalist, and author. In his early ministry he preached a series of sermons against intemperance and kindred vices which were afterwards brought together in a volume of *Lectures to Young Men.* At the time of his editorship of the *Cincinnati Journal* he took a strong position in opposition to the institution of slavery; in 1856 he aided the Republican party in the Presidential campaign both by his writings and public addresses; and while in England in the summer of 1863 he plead with great eloquence and success the cause of his country before British audiences, rendering valuable service by his vindication of her motives and objects in the Civil War. In America his fame as a political and popular lecturer is great. He has been at various periods, in addition to his other labors, editor of the *Cincinnati Journal* (1836), *Western Farmer and Gardener* (about 1840), *New York Independent* (1861–1863), and the *Christian Union* (1870–81). His home is in Brooklyn, N. Y., from which city he withdraws in the summer to his country-seat at Peekskill-on-the-Hudson. He married Miss Eunice Bullard, August, 1837. Of the children of this marriage three sons and one daughter are living. Mrs. Beecher has herself no small reputation as a writer on home topics. Her contributions, published in various periodicals, have been republished in book-form. She is also the author of a story of Western missionary life, *From Dawn to Daylight*, which is believed to afford a picture of the early experiences of ministers on the frontier, drawn from her own life.

Mr. Beecher's life in the midst of his great popularity was overshadowed by what is known as "the great scandal." In 1874, Mr. Theodore Tilton, then a member of Plymouth Church, brought a charge of adultery with his own wife against Mr. Beecher. On Mr. Beecher's demand, a joint committee was appointed by the church and congregation, which investigated the matter and reported unanimously that the accusation was groundless. The report was adopted by the church and congregation without dissent. Subsequently, proceedings at law were brought by Mr. Tilton against Mr. Beecher. The trial which ensued occupied several months. The only evidence offered in support of Mr. Tilton's accusation were alleged confessions of Mr. Beecher—which he, under oath, denied having ever made—and certain letters of Mr. Beecher, the language of which was confessedly ambiguous. The jury disagreed, standing nine for acquittal and three for conviction. This trial was followed by two ecclesiastical investigations. The New York and Brooklyn Association of Congregational ministers, of which Mr. Beecher was a member, appointed a committee to investigate, and on its report unanimously declared him entitled to Christian confidence and fellowship. A council of Congregational churches and ministers was also called by Plymouth Church to advise with it respecting its proceedings growing out of this matter. It was probably the largest council ever called by any church in the history of Congregationalism, and it included representative men from all sections of the country. While not undertaking a direct investigation of the charges against Mr. Beecher, the council extended to him their Christian fellowship and sympathy, and expressed their confidence in his integrity. The whole matter has been complicated in the public mind by Mr. Beecher's confessed unwisdom in the selection of some confidential friends in this trying period of his life, and by his evident attempt to keep the scandal from coming before the public; but, despite some perplexity and doubt left in the minds of those who never had the opportunity and time to investigate the extraordinary charges, and measure the evidence on which they were based, Mr. Beecher has retained his position as the most eminent preacher and one of the great thought-leaders of America.

Mr. Beecher's published works are as follows: 1. *Lectures to Young Men* (Boston, 1850, 12mo, many editions; republished in Dublin); 2. *Industry and Idleness*, two of the *Lectures to Young Men* (surreptitiously published separately); 3. *The Star Papers* (New York, 1855, 12mo); 4. *The Star Papers* (2d series, New York, 1858, 12mo); 5. *Life Thoughts* (Boston, 1858, 12mo), 25,000 copies sold within a few months of publication—consists of selections from his extemporaneous sermons made by one of his congregation and afterward revised by himself; 6. edited *Plymouth Collection of Hymns* (New York. 8vo, 12mo, 18mo, etc.); 7. *Royal Truths* (1864); 8. *Norwood*, a novel (1864); 9. *Life of Christ* (1871). In addition to these are an edition of *Sermons*, selected by the author and comprised in two volumes; a series of his sermons, which for a number of years were published in a weekly publication entitled *Plymouth Pulpit;* a volume of *Morning and Evening Exercises for Devotional Use*, culled from his prayers and sermons; a volume of his *Prayers*, taken down in shorthand and printed without revision or alteration; and a volume of sermons on *Peace and War* (1863).

In person Mr. Beecher is about the medium height and considerably above the medium breadth, though without corpulency. His forehead is high rather than broad; his face round and always clean-shaven; his mouth firm, with humor lurking in the corners; his eyes bright, but tender rather than sharp. His voice is musical, flexible, and deep, and admirably trained. Elocution and rhetoric were both passionate studies with him in his youth. He is very fond of children, and children are very fond of him. His powers of observation are keen and quick, and he is a student of men and things rather than of books. There is no branch of knowledge which interests humanity in which he is not interested. His mind is one of singular alertness as well as of singular fertility, and he passes by transitions inexplicable to men of slower mental movement from the grave to the gay, from the serious and pathetic to the humorous, or even to hilarity. His fame as a journalist would be considerable were it not overshadowed by his fame as a preacher and orator. The first successful venture in agricultural journalism, the *Western Farmer and Gardener*, in Indianapolis, was the monthly reproduction of an "Agricultural Department" edited by Mr. Beecher in the *Indiana Journal*, the first of those agricultural departments which have become so popular a feature of the American weekly newspaper since. His contributions to the *New York Independent* did much to raise it to its front rank as an anti-slavery journal during the period immediately preceding the Civil War. Subsequently, he founded and organized the *Christian Union*—was the first to adopt the quarto form, since so largely adopted by the weekly religious press, and the first to conceive and execute successfully the idea of an undenominational religious newspaper. As a journalistic writer he has ranged from strong editorials on great public questions to lighter essays on all sorts of topics—social, natural, artistic, and domestic—since gathered into book-form under the title of *Star Papers*. His inventive thought has shown itself in other departments. His church was the first to build, in connection with its edifice, church parlors for social gatherings, with a kitchen and other facilities for church entertainments, which have since become a common annex to American churches. His *Plymouth Collection* was the first successful or even considerable attempt to provide a hymn- and tune-book for congregational uses. Plymouth Church was the first church in which the ordinary type of church architecture was departed from, and a nearly square auditorium with broad galleries, gathering the audience about the speaker, was adopted. It was also the first church to substitute a platform desk for the old-time pulpit.

It is, however, as a preacher and orator that Mr. Beecher is chiefly known. He speaks generally either wholly extemporaneously or from very brief notes. The elements of his power are various and difficult of complete analysis: a rich and sympathetic voice, great vigor in action, a natural dramatic instinct, a general and effervescent humor, a poetic and dramatic imagination, a wholly inartificial pathos, a warm sympathy for men of all classes and conditions and in all varied mental and moral states, and a profound, living, and habitual faith in God, carrying with it a spiritual appreciation of the experimental and practical side of religion, rather than its dogmatic or philosophical side, and an insight into and grasp of the helpful and inspiring aspects of scriptural teaching. On the effect of his influence as a theologian judgments widely differ, but not on its extent. He has exerted a wider influence in leading and moulding religious thought than any other living preacher. He belongs to the evangelistic school; his theology includes belief in a personal God, who has made special revelation of himself in the Scriptures, and especially through his Son Jesus Christ, and has provided pardon for sin and help for the sinful toward a new and better life. But he rejects the doctrine of the plenary or absolutely infallible inspiration of the Scripture, regards the first chapter of Genesis as legendary, and is in philosophy a Christian evolutionist. He was one of the first to subscribe to a fund to ensure the publication of Herbert Spencer's works in the United States. The central truth in his system is that God is love, that His government is to be interpreted rather by that of the household than by that of the state, and especially that the monarchical figures by which God's sovereign authority was illustrated by the ancient Hebrew writers, and which have since been literally interpreted by the Calvinistic divines, are misleading in a republican country and age. He rejects the doctrine of endless punishment, though he is not a restoration-ist. His views perhaps incline more to a modified form of annihilation, though on this point he has never explicitly defined his position. In polity and ecclesiastical connections he is a Congregationalist, but the breadth of his sympathies and the independence of his mind make him rather a member of the Church universal than of any particular branch of it, and he is looked upon alike with suspicion and distrust by many in his own denomination, and with admiration and love by many outside of it.

Mr. Beecher withdrew Oct. 10, 1882, from the Association of Congregational ministers in Brooklyn, of which he had been a prominent member ever since its organization, giving as his reason for so doing his desire to relieve his brethren in the ministry from all sense of responsibility for his theological views. This action does not affect his relation to the denomination, no membership in any ecclesiastical body being essential to good standing in the Congregational ministry, and his church retains its connections with the Association. This step he accompanied with a statement of his theological views, but quite in harmony with previous utterances. He reasserts his belief in a personal God, the Trinity, the divinity of Christ, the Holy Spirit, providence, miracles, regeneration, the inspiration of the Bible, the atonement, and a future punishment. But he gives to each of these doctrines a somewhat peculiar interpretation. He regards Christ as the Divine Spirit under the limitations of time and space and flesh; providence and miracles not as violations or interferences with, but as divine uses of, natural laws; he lays less stress on the moral influence of the atonement as the fact that is clear and comprehensible, while its possible effects on the Divine Mind and on the universe at large, of which there are hints in the Scriptures, he regards as beyond our comprehension; and finally, he holds that the revelation of Scripture respecting future punishment does not go beyond the fact that "the results of a man's conduct reach over into the other world on those who are persistent and inexcusably wicked, and man's punishment in the life to come is of such a nature and of such dimensions as ought to alarm any man and put him off from the dangerous ground and turn him towards safety." (L. A.)

BEECHER, JAMES CHAPLIN, born in Boston, Mass., Jan. 8, 1828, youngest son of Lyman Beecher. Graduated at Dartmouth College, class of 1848. Followed seafaring life as sailor and officer for three or four years. Entered Andover Theological Seminary, class of 1857, but in his second year was appointed seamen's chaplain to China, where he served five years. In 1861 was appointed chaplain to First Long Island volunteers, and served five years in the grades of chaplain, lieutenant-colonel, colonel, and brevet brigadier-general, raising and training one of the first regiments of colored troops. In 1866 pastor to Congregational church in Oswego, N. Y., about five years. In 1871 pastor to Congregational church in Poughkeepsie, N. Y., about five years. In 1876 removed to his mountain-lodge "Lakeside," in the Catskills, Ulster co., N. Y. His home is thoroughly unique, being twenty-one miles from the nearest railroad and telegraph-station and seven miles from the nearest post-office. He lived here for years with his wife and several adopted children, doing volunteer and independent home-mission work. (L. A.)

BEECHER, LYMAN (1775–1863), born at New Haven, Conn., Oct. 12, 1775. His early education was acquired in North Guilford and New Haven, where he prepared for Yale College, graduating in 1797. After a year's study of theology under Pres. Dwight he began his ministry at East Hampton, L. I., Dec., 1798, where he remained till 1810, during which time he married Roxana Foote. In 1810 he was called to the First Church of Litchfield, Conn. Here were born Henry Ward and Harriet (Mrs. Stowe), and here his first wife died. One year later he married Miss Harriet Porter of Portland, Maine. His ministry here lasted till 1826, when he took charge of Hanover Street Church, Boston. He preached here for six years, removing in 1832 to Cincinnati, Ohio, where he was at the same time pastor of the Second Church and president of Lane Theological Seminary till 1851. Then he returned to Boston, and after four years' residence there removed to Brooklyn, N. Y., where he died Jan. 10, 1863, in his eighty-eighth year.

From 1815 to 1851 there was no preacher in America whose influence was greater or whose name was more widely known. Mr. Beecher's sermons and discourses were marked by great force and energy of thought and diction, characteristics which also distinguished the life and character of the man, as evinced by his pronounced views of theological questions, his "boldness in denouncing laxity in regard to the standard of Christian orthodoxy," the simple faith and strict integrity of his own private life, and the prompt courage with which he undertook to reform public evils. In 1806, during his ministry at East Hampton, he published a sermon on duelling, suggested by the duel between Burr and Hamilton. It made a great impression, and when Henry Clay was candidate for the Presidency the Democrats published it in an edition of 40,000 and scattered it all over the North. Subsequently, in Litchfield, the unlimited use of spirituous liquors at ministerial ordinations, General Assemblies, and private gatherings fired Mr. Beecher's heart, and he undertook the work of reform with such success that the Massachusetts Temperance Society was established within a year after his reading his report on the temperance question at the General Association of Connecticut—"the most important paper," he says, "that I ever wrote." Ecclesiastical meetings gave up the use of spirits, the legislature took favorable action on the question, agitation began in other States, and the great temperance reformation was started on its course. He preached at Litchfield at this time a famous series of sermons on intemperance. It consisted of six sermons on the nature, causes, and cure of intemperance, and grew out of Mr. Beecher's great personal solicitude for two very dear friends in his parish who were addicted to drink. The sensation was very great when the sermons were preached, and the impression made was deep and strong. They became powerful aids in temperance reform, and were translated into many foreign languages "carrying with them the burning energy which first gave them birth." When the Unitarian controversy had reached its height, and Dr. Channing was presenting with his singularly persuasive grace the views and opinions of that school to the churches and people of Boston, Dr. Lyman Beecher was by common consent selected to represent the sterner theology of the Puritans in what was then the foremost pulpit of New England, that of the Hanover Street Congregational Church. The contrast between the two men was as great as between the two schools which they respectively represented—Dr. Channing, mild, genial, suave, cultured, winning assent; Dr. Beecher, brusque, independent, unconventional, forceful, coercing attention and compelling conviction. As a preacher he habitually used notes, but never confined himself to them. He was accustomed to say that no man was fit to preach unless he was hot enough to boil over. He met Unitarianism on its own ground; appealed no less than his great rival to human reason; and undertook to show that Calvinistic theology was conformable to reason and was confirmed by observation as well as by Scripture. But, though by nature an intense controversialist, he never forgot the immediate practical work of the preacher, and in all his preaching aimed rather to use truth than to demonstrate it. He sought spiritual rather than merely intellectual results. He instituted revival meetings, and preached a series of revival sermons that brought within the sphere of their influence throngs of people in every circumstance of society, who sought to satisfy their aspirations by a definite and positive belief such as they derived from Dr. Beecher's ministrations.

The great crisis of Dr. Beecher's life was the part which he took in the struggle between the two factions of Presbyterianism, the Old School and New School, in 1836–38. The contest was a fierce one, and as the head of a theological seminary he naturally became an object of attack. The method of his theological warfare peculiarly exposed him to assault. This was to undermine his theological adversary by not only granting, but even stating clearly and strongly, whatever he could see to be true in his adversary's position. He had been criticised while in Boston for what was regarded by his critics as his concessions to Unitarianism; and when he entered the more conservative Presbyterian Church, he was at once assailed for his departure from the faith of his fathers by that party in the Church which held to a strict historical Calvinism. He went through the ordeal of a trial before the General Assembly, and fought valiantly for liberty of interpretation, occupying substantially the position ever since occupied by the New School element in the Presbyterian Church. His numerous publications, mostly sermons, include a volume on *Political Atheism*. His *Autobiography*, with selections from his sermons, edited by his son Charles, was published in New York, 1865, 2 vols. 12mo. His works were published in Boston, 1852, 3 vols. 8vo. He was the father of thirteen children, of whom five were daughters. All the sons who reached maturity became Congregational ministers. (L. A.)

BEECHER, THOMAS KINNICUT, son of Dr. Lyman B., born Feb. 10, 1824. Graduated at Illinois College, class of 1843. Teacher in Philadelphia, Pa., and Hartford, Conn., from 1846–51. Ordained in the New England Church, Williamsburg, Brooklyn, L. I., 1851, where he served till 1853. In 1854 he was called to the pastorate of Park Church, Elmira, N. Y., where he remains up to date (1882). He has exerted considerable influence as a lecturer and as a philanthropist, and was distinguished and very successful as a teacher. He also has had some prominence in advocating the political doctrines of the Greenback party.

His church is essentially Congregational in its government, though it is entirely independent of all ecclesiastical bodies. It is remarkable for the breadth of its organization and the variety of its work. The church buildings include not only an auditorium and a Sunday-school room, but social parlors, a kitchen, a room with stage and scenery for church and Sunday-school entertainments, and bed-rooms which the church can use hospitably, especially for the poor, as occasion may require. As a preacher Mr. Beecher is singularly earnest and unaffected, and, without the graces of oratory, is a popular preacher. Of his literary productions the best known is *Our Seven Churches* (New York, 1870), a series of sermons on the leading American denominations. (L. A.)

BEECHER-STOWE, HARRIET ELIZABETH, daughter of Lyman Beecher and Roxana Foote, was born at Litchfield, Conn., June 14, 1812. She taught in the school of her sister Catharine at Hartford, Conn., for several years, and was married in 1836 to Prof. Calvin E. Stowe, then of Lane Theological Seminary. She first appeared before the public as an author in 1849, at which time she published *The Mayflower; or, Sketches of the Descendants of the Pilgrims*, a book of tales and sketches of New England life, which has been republished several times since in this country, and has been republished in England. In 1851 she was asked to furnish a story to the *National Era*, an anti-slavery journal printed in Washington. She commenced, expecting to complete her sketch in four or five numbers; the story, however, grew as she wrote, and extended in weekly issues of the paper from Jan. 5, 1851, to April 1, 1852. It excited considerable interest during its serial publication, but this did not foreshadow the immense sensation which it produced when published in book-form in two volumes and under the title *Uncle Tom's Cabin*. In eight weeks 100,000 copies had been sold in the United States, and in four years 313,000. According to the *Edinburgh Review*, more than a million copies had been sold in England within the year of its publication, "probably ten times as many as have been sold of any other work except the Bible and the Prayer Book." Before the end of that year it had been translated into French, Italian, Spanish, Danish, Swedish, Dutch, Flemish, German, Polish, Magyar. There are now thirteen or fourteen French versions, two different Dutch translations, thirteen or fourteen German ones, two Welsh, two Russian, three Magyar, two Wallachian. There are also Armenian, Arabic, and Romaic translations, and it is said that there is a Chinese and a Japanese version. In less than three years from its appearance it had been dramatized in upward of twenty different forms, and enacted in every capital in Europe and throughout the Northern States of America. In 1853 she visited Europe, and was warmly received by all the friends of the anti-slavery cause. In 1856 *Uncle Tom's Cabin* was followed by *Dred, a Tale of the Great Dismal Swamp*, a story in some respects quite as dramatic as *Uncle Tom*, though never equalling it either in influence or reputation. Her other principal stories are—*The Minister's Wooing, a Story of New England Life in the Old Pilgrim Days; The Pearl of Orr's Island, a Story of the Coast of Maine; Agnes of Sorrento, a Foreign Sketch; Oldtown Folks*, another story of old New England life; *My Wife and I;* and *Poganuc People*. An article published in the *Atlantic Monthly*, entitled "The True Story of Lady Byron's Life," subsequently extended to a volume entitled *Lady Byron Vindicated*, created a great sensation at the time, but was of an ephemeral nature and has no permanent place in literature. She has a summer home in Hartford, and a winter home in Mandarin, Florida. In person she is tall and spare. Her face, which has a very intellectual cast, is, when in repose, dreamy and abstracted in its expression, but in social conversation she is as brilliant and original as she is in her writings. The warm-hearted philanthropy which shows itself in her works is equally manifested in her private life and character, and the religious faith which she has so powerfully depicted in her various stories is vital in her own experience. Some of her religious poems, which have been collected and published in a small volume, are among the most beautiful in American literature. She has had a number of children, several of whom are living.

The following is a list of Mrs. Stowe's published works: 1. *Mayflower; or, Sketches of the Descendants of the Pilgrims* (N. Y., 1849, 12mo); 2. *Uncle Tom's Cabin* (Boston, 1852, 2 vols. 12mo); 3. *A Key to Uncle Tom's Cabin* (Boston, 1853, 8vo); 4. *Sunny Memories of Foreign Lands* (Boston, 1854, 2 vols. 12mo); 5. *Geography for my Children* (Boston, 1855); 6. *Dred, a Tale of the Great Dismal Swamp* (London and Boston, Sept. 13, 1856, 2 vols. 12mo); 7. *Our Charlie, and What to Do with Him* (Boston, 1858, 12mo); 8. *The Minister's Wooing* (N.Y. and Boston, Oct., 1859, 12mo); 9. *The Pearl of Orr's Island* (Boston, 1862, 12mo); 10. *Agnes of Sorrento* (Boston, 1862, 12mo); 11. *Reply on Behalf of the Women of America to the Christian Address of Many Thousand Women of Great Britain* (1863); 12. *The Ravages of a Carpet* (1864); 13. *House and Home Papers* (Boston, 1864, 16mo); 14. *Religious Poems* (Boston. 1865, 16mo); 15. *Stories about our Dogs* (Edin., 1865, 12mo); 16. *Little Foxes* (Boston, 1865, 16mo); 17. *Queer Little People* (Boston, 1867, 4to); 18. *Daisy's First Winter, and Other Stories* (1867, 12mo); 19. *The Chimney Corner* (Boston, 1868); 20. *Men of Our Times* (Hartford, 1868, 8vo); 21. *Oldtown Folks* (Boston, May 15, 1869, 12mo); 22. *The American Woman's Home*, with Catharine E. Beecher (Phila., 1869); 23. *Lady Byron Vindicated* (Boston, 1869, 16mo); 24. *Pink and White Tyranny* (Boston, 1871, sm. 8vo); 25. *My Wife and I* (Boston, 1871); 26. *Poganuc People* (New York, 1878). (L. A.)

See Vol. III. p. 417 Am. ed. (p. 484 Edin. ed.).

BEE-KEEPING. In the United States bee-keeping is conducted on the largest and most liberal scale and with large pecuniary returns. In 1851, Rev. L. L. Langstroth invented the movable-frame hive; and this invention marks a new era in bee-farming, or, rather, bee-farming proper may be said to date from that time. It is true that Munn of Great Britain, Debeauvois of France, and Dzierzon of Germany had invented movable-frame hives, but of these only Dzierzon's had any practical value, and Dzierzon's hive was very little better than Huber's. But Baron Berlepsch of Germany in 1847 and 1850 made improvements on the Dzierzon hive which made it substantially identical with the somewhat later invention of Langstroth. Langstroth had no knowledge of what was done by European hive-inventors, but he completely revolutionized bee-keeping. His hive is to-day the one which almost all American and British bee-farmers use; but owing to the inventor's failure to insist upon his patented rights, he never received much pecuniary benefit from the admirable improvements his hive embodied. Langstroth's work on *The Hive and the Honey-Bee* contributed largely to the subsequent rapid development of apiculture in America; and it is conceded by experts that no observer, Huber excepted, has given us more important information regarding the honey-bee than Mr. Langstroth has done. Quinby's *Mysteries of Bee-keeping* is another American work which has had, and still has, a wide currency, and has greatly stimulated apiculture in the United States. Quinby was the inventor of a bellows bee-smoker, which in its improved form is regarded as an indispensable appliance by skilled apiarists. The *Bee-keeper's Text-Book* (1860), by N. H. and H. A. King, has had an extensive sale. There are now (1883) published in the United States at least eight periodicals devoted to bee-keeping. One of these is a prosperous weekly, and they all appear to be well-patronized and influential journals, their aggregate circulation being estimated by some authorities at 50,000 copies. The recent American literature of the subject is quite extensive. Besides published books, in most of the leading agricultural journals there are regular departments devoted to the apiary, edited by expert bee-masters. The States and Territories of the Union, as well as the Canadian provinces, have for the most part associations of apiarists; and these, as well as many minor societies, send delegates to the meeting of the North American Bee-Keepers' Association, a large and influential organization whose yearly gatherings are attended by the most progressive and enterprising honey-farmers of this continent. At these meetings new methods and new appliances are exhibited; new varieties of bees are shown; the operations of grading and marketing bee-products are discussed; and the various plants adapted for use as bee-pasture are exhibited.

Fears are often expressed that "over-production" of honey may ruin the market for the product. But the indications are that the market will dispose of all the honey that is produced. Honey has qualities which admirably adapt it to beer-makers' use, and in Great Britain alone some 9,000,000 pounds a year are used in the breweries; and in the United States, as well as in Germany, its use is rapidly increasing. Honey is not only better than sugar for such uses, but at current market-rates it is much cheaper. Well-directed and effective efforts are made to extend the domestic use of honey as an article of food. Great care is now taken to put the article upon the market in a cleanly and attractive shape, and the effect has been to greatly stimulate the use of honey as food. Within the four years 1879–82 the export of honey from America to Europe has trebled. But the great element of increased profit in recent honey-farming has been the wonderful reduction in the cost of producing the article. Since 1877 the use of the "artificial honey-comb foundation" has very greatly increased the production of the staple. The published reports show that although the winter of 1880 was so severe as to destroy more than half the colonies of bees in North America, there were nevertheless in 1881 about 2,500,000 colonies, producing on an average 69 pounds of honey per colony, or in all not less than 138,000,000 pounds. In the same year the increase of bees was 71 per cent. Some single colonies produced as high as 400 pounds of comb-honey, while there were instances where a single hive gave more than 500 pounds of extracted honey. These cases, however, were entirely exceptional, the extremely favorable results being due to great skill in management, conjoined with local advantages in respect to pasture and to favoring atmospheric conditions. Since the honey-statistics for 1881 appear to be specially trustworthy, particular attention having been given to the careful collecting, sifting, and discussion of the facts and figures, we may be permitted to cite some additional points of interest regarding the honey-crop of that year. The great honey-producing State of California, owing to a remarkable deficiency of the rainfall, gave an increase of only 8 per cent., while Dakota gave 130, North Carolina 140, New York and Kentucky each 72, Pennsylvania 19, Michigan and Illinois each 95, and Wisconsin 118 per cent., of increase. The State of New York stood first in the quantity of honey produced, and the next States in their order were Pennsylvania, Ohio, Michigan, Wisconsin, Illinois, and Louisiana. Canada produced more honey than Ohio. Dakota reported an average of 159 pounds per colony. New York produced more than 1,000,000 pounds of comb-honey and about 2,000,000 of extracted honey.

The best part of the United States for bee-farming is considered to be the Pacific versant, and especially the southern part of California. There is in that region a long, dry, equable summer, with no storms, no hail, and no thunder, and an abundant supply of flowering plants affording the due successions of forage. When the plains are dry and their plants dead, the mountains are in full bloom. In some places honey-dew is copiously produced upon the trees. The four southernmost counties of California in 1880 produced more than 4,000,000 pounds of honey. There are probably more than 500 bee-ranches in those counties. In a good year a hive will there average 500 pounds, besides producing at least one new swarm. A single apiary in Los Angeles co., Cal., has reported an average of 362 pounds of honey to 62 hives. Very generally, the Californians use the centrifugal honey-extractor, removing the honey every few days, and returning the empty combs to the hive. Much of the California honey is marketed in Japan, in the Hawaiian Islands, and in South America. The bee-hive is the chosen cognizance of the Mormon people of Utah, and their own name for the territory is "Deseret," which word, they tell us, means "honey-bee" in their esoteric language. At all events, apiculture receives great attention there, and it has of late proved a very profitable business. The climatic conditions are not unlike those of California, and the same thing may be said of Nevada and a large part of Colorado and the rest of the Rocky Mountain region.

The coast-regions of the Gulf States and the South Atlantic seaboard have in general a light sandy soil, with many and extensive swamps. These tracts have long been noted for honey-production, and they present many features which mark them as good regions for the bee-industry. Thus far, however, much of the bee-keeping has been of the most primitive kind. Many bees are kept in "bee-gums"—rude sections cut from a hollow log—and considerable amounts of wild honey and wax are gathered from the forests. The occupation of hunting for wild bees thus attains somewhat of the dignity of a regular industry. The vast forest wilds of tropical America furnish large amounts of commercial honey and wax. Some of the material is gathered by bees of the various native species, and the bee-industry of that vast region is altogether of the rudest description. The honeys of this class are very impure, by reason of the careless methods employed in collecting them, and hence they are mostly sold to beer-manufacturers. The use of the extractor, and the corresponding practice of returning combs to the hive, have naturally led to a proportionate reduction in the supply of bees-wax for commerce. But much commercial bees-wax comes from Senegal, the Guinea coast, India, Indo-China, etc.; and paraffine, earth-wax, and other hydrocarbons are extensively used either as substitutes for wax or as adulterants.

The Ligurian or Italian bee was introduced into the United States in 1861 by Langstroth and others, and its superiority to the common black bee is generally conceded. For beauty, docility, and industry it is not excelled by any kind of bee. Many other kinds have been brought to this country for trial. At one time some attention was given to the German heath bee, but most persons who have given it any attention consider it to be the old-fashioned black domesticated bee, with scarcely a point of difference. Messrs. Jones and Benton have introduced successfully the Syrian and Cyprian bees. They are less docile and manageable than the Italians, but are more prolific, and they persist in breeding even when no honey is being gathered. A promising cross has been made between the Italian and the Syrian bees, and it seems likely that the product will be superior to either of the parent stocks. The cross between the common bee and the Italian is not generally liked. It is the practice for apiarists to ship impregnated queens of the improved breeds by mail, the insect being enclosed in a little wire cage. Thus at a trifling expense a colony can be repeopled with an improved kind of bee in a very short time.

We may now enumerate briefly some of the devices by which advanced apiarists have in so marked a degree increased the profits of bee keeping. In the various movable-frame hives, of which the Langstroth hive is the type, each comb is built within a separate frame, and from eight to twelve of these frames are placed in each hive. A frame, with its attached piece of comb, may be removed and examined at any time without the killing of a single bee, and without materially exciting the anger of the swarm.

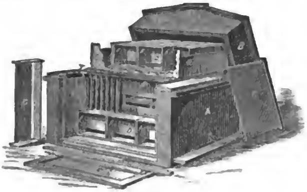


FIG. 1.

We present herewith an illustration (fig. 1) of a movable-frame hive of excellent pattern, generally known as the chaff-eclectic hive. *A* is the front of the hive, and, like the back, it is double-walled and four inches thick, the space between the outer and inner walls being filled with chaff, which serves to prevent the collection of moisture within the hive. The inside walls *H* have a porous surface, permitting the moisture to pass through into the chaff, while it cannot be penetrated by insects. The cover *B* is rendered waterproof by its construction. The movable side *C* is panelled to prevent warping. The section-holder *D*, with thin wood separator firmly attached, renders top bars unnecessary, and enables one to remove and replace the section-boxes with ease. There are in a hive eleven section-holders, each holding three sections. The rack *G* on top of the brood-nest, with holders containing section-boxes, is cut away in the engraving to show the interior. It is open at top and bottom, but rabbeted near the bottom, so that the section-holders are kept at the proper distance above the top bars of the movable frames. When in use an enamelled cloth is spread over the top to keep the bees inside. *E* is one of the two close-fitting division-boards, which hang in the hive just as the frames hang, and these boards serve to increase or diminish the hive-capacity at will. *I* shows the end of one of the movable frames, rabbeted on the under side to prevent movement lengthwise; the bees are thus excluded from the ends of the frames, and as they come in contact only with the metal rests, they are never fastened by the bees. This metal rest extends ¼ inch above the top of the hive, so that no bees can get crushed in putting in the frames. *F* represents a section-box in a section-holder.

When working the swarm for comb-honey, both sides and the entire top are covered with these sections, in each of which the bees build a sheet of comb-honey 5 inches square and 2 inches thick. The hive contains eight frames, but when running for extracted honey twelve frames are used.

To prepare for winter, remove all but six frames, which place in the centre of the hive, and bring the division-boards close up on both sides. Now place a chaff cushion 2 inches thick on top of the frames, and the bees will winter perfectly on the summer stand.

The hive shown in fig. 2 contains the same sized frames and section boxes as the chaff hive (fig. 1). As it is single-walled, it is cheaper, and is a general favorite throughout the South and in California, where there is no need of protection against extremely cold weather.

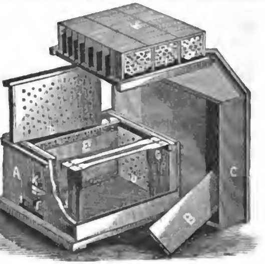


FIG. 2.

The common way of extracting honey a few years ago was to "brimstone the bees," then, taking the comb, honey, bee-bread, and all, to press and strain the conglomeration. This antique method gave a mixture that was often very unpalatable and unclean, and sometimes quite unfit for the market.

The honey-extractor is a machine that will empty the frames of honey without discoloring it or injuring the combs. It was invented by Von Hruschka, a German resident of Venice, Italy, but it has been greatly improved by American ingenuity.

The can here shown (fig. 3) will not only take the largest frame in use, but it is also adapted for use with small frames, and by a simple device the cappings and all pieces of comb can be freed from honey. The revolving basket that receives the combs rests on a cone-shaped metal stand, and rises from the centre of the bottom high enough to hold over fifteen gallons of honey below it. This basket is light, but strongly made. The over-motion gearing gives great ease in running and facilitates operating. A few turns of the crank will throw out the thickest honey. The bottom slants from all sides to the centre, and a channel conducts the honey to the faucet.

Honey should be allowed to remain a short time in the extractor, so as to cause all specks of comb, etc., to rise to the top, leaving it clear, in which state it may be drawn off without the troublesome process of straining. In extracting, the frame of comb is taken from the hive (the bees being shaken or brushed off), carried to the extractor, uncapped with a knife specially made for the purpose; two or four frames are placed in at a time, and the honey is thrown out by centrifugal force. The frames are then reversed and the other sides emptied, and are then ready to be returned to the bees, to be refilled. Thus the comb is saved, the bees waste no time in making more, and the sense of their loss seems to stimulate them to increased industry. As 20 pounds of honey are required to produce 1 pound of comb, and 4 pounds of comb fill an ordinary hive, it is plain that by the use of the extractor 80 pounds of honey are saved to each hive, besides the time and labor consumed in making new combs. Honey obtained in this way is not tainted with any foreign substance, and is consequently more wholesome than strained or even comb-honey, since the wax is indigestible.

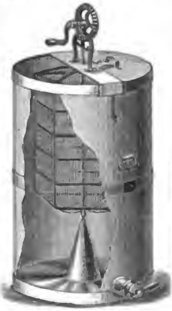


FIG. 3.—Honey Extractor.

Bees cannot rear brood or store honey without combs, and yet they will not build combs under ordinary circumstances except when honey is abundant. If left to themselves, they will often build so much drone-comb as to crowd the hive with a host of useless consumers. Hence bee-keepers have long felt the need of some way to furnish the hives with comb already built. American ingenuity has been equal to the task, and we now have a machine by which sheets of pure bees-wax are impressed on both sides with the exact shape of the bottoms and the beginnings of the side-walls of the cells. The bottoms are made very thin, and the bees with their mandibles soon draw out the side-walls into full-depth cells. This is called "artificial comb-foundation," and is made for both the brood-nest and section-boxes. For the brood-nest it should be firmly attached to the top bar of the frame, and should come within about $\frac{1}{8}$ inch of each side and $\frac{1}{2}$ inch from the bottom bar. It should measure about $4\frac{1}{2}$ square feet to the pound. In the production of box-honey for market, fill the section-boxes with foundation, the bottoms of the cells of which are made so thin that one can see to read through them. This kind of foundation runs from 10 to 14 square feet to the pound.

Among the advantages gained by the use of comb-foundation are the following: It will ensure straight combs of easy management, and will prevent the building of drone-comb by the bees. It will, if inserted in the brood-nest in early spring, stimulate breeding, and thus assist in the rapid building up of the colony or in forming new ones. Soft comb-foundation may be inserted in a choice hive to secure eggs for queen-rearing, for a soft comb is the kind on which bees are most apt to build good queen cells. It is very advantageous to insert the foundation in the place of those full combs which are to be set away for wintering. The foundation is very useful to secure continuous breeding by feeding at times when combs are scarce or when bees are loath to build. It also enables the farmer to secure full supplies of autumn honey at a time when bees are not inclined to build comb.

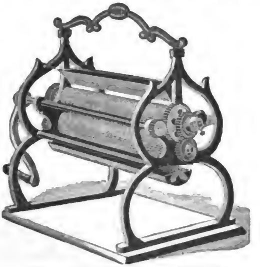


FIG. 4.—Comb-foundation Machine.

By the use of this machine all the old, dark, worthless combs and scraps, together with the cappings removed from combs when extracting, are turned by steam process into pure yellow bees-wax. The combs are placed in the perforated tin vessel *B*, and this vessel is put into the can *A*, which is set on the boiler shown in the cut. The steam penetrating the top, bottom, and sides of the vessel containing the combs, they are soon reduced to wax.

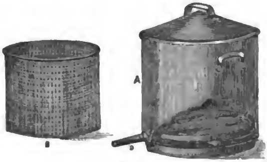


FIG. 5.

Late in summer, when bees are rich in honey, they are harder to control than in early summer. The bellows smoker, filled with cotton rags, wood, or other combustible material, will hold fire for hours. A few puffs of smoke into the entrance of the hive will cause the bees to fill themselves with honey, after which they may be handled with impunity.

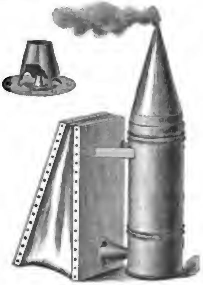


FIG. 6.—Bellows Smoker.

The entrance-feeder is a valuable device. It holds about half a pint, and fits so closely to the entrance of the hive as to exclude all robbers, and at the same time it gives all the bees inside free access to their feed. In cold weather bees cannot take feed from the entrance, and at such times the feeder can be placed above the bees. In this case two feeders are fastened together by the sides opposite *D*, and the bees come up through a hole in the quilt or honey-board. The top is cut away in the engraving to show the long deep grooves containing the feed, which is poured in at the top and closed by a tin slide, as shown.

During a lull in the honey-flow, between the closing of the bloom of some plants and the opening of others, a little daily feeding will stimulate brood-rearing and fill the hive with young, vigorous workers to gather the honey for surplus as soon as it is secreted in the flowers.

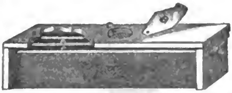


FIG. 7.—Entrance-Feeder.

Apiaries.—The site for an apiary should be chosen so as to protect the bees from storms. The ground should incline towards the south-east, and the hives should face to the east, so as to receive the first rays of the morning sun, which thus serves to dry the alighting-boards and warm the entrances. In a location where there is no natural protection from wind, such as a hill or a forest, a close board fence on the north and west sides should be erected. A tree or shrub on the south side of each hive is much to be desired, as it gives shade during the heat of the day. Great noontide heat is very oppressive to the bees, causing them to leave the combs and scatter on the sides of the hive in order to reduce the temperature, and thus avoid the melting of the combs. Water is indispensable in the building of the comb and the rearing of the brood. If there is not some sunny stream near the apiary where the bees can safely obtain it, water should be furnished them in vessels filled with little floats in a warm place, sheltered from the winds, where they can drink without risk of drowning.

Every bee-keeper is directly interested in producing honey-bearing plants. All vacant lands, roadsides, and byways should be supplied with such plants as white or alsike clover, or melilot, catnip, hoarhound, mustard, etc. The planting of such trees as linden, locust, elm, tulip tree, and wild cherry should be encouraged. All fruit-bearing trees, shrubs, and vines produce large quantities of well-flavored honey. There is hardly a place where vegetation flourishes in which bees will not do well. Even in large cities a few colonies may be kept with profit, depending for forage upon the parks and gardens. Apiaries containing from ten to seventy-five colonies are sometimes kept on the flat-roofed house-tops; in this case, the space being limited, the hives are necessarily put close together, and each alternate one should therefore be painted a different color, to enable the young queen to locate her home when going out for the first time in her life on her bridal-trip. It would be certain death for her to enter the wrong hive on her return, and she would thus leave her colony without the means of rearing a new queen, and the swarm would soon waste and die unless supplied by the bee-keeper with another mistress.

In the country the ground intended for the apiary ought to be laid out so that the hives may form rows about 10 feet apart, and the same distance in the rows. The spot occupied by each hive should be covered with white sand to the depth of 3 inches over a space of about 3 feet square. On this sand a platform should be made as wide and long as the hive, and about 4 inches high, with a broad board slanting downward from the entrance of the hive to the ground. The sand will remain very firm, and keep down all weeds and grass, and will enable the heavily-laden bees returning at nightfall to crawl up and reach the hive.

In starting an apiary, if Italian bees in improved hives are not obtainable at a reasonable price, the intending bee-keeper should purchase a number of stocks in common hives, and when the hives become strong in bees he should transfer them into movable frames by drumming them out of the old hives and putting them into the new ones, the frames of which have been previously filled with comb-foundation. If there is not honey in the flowers when this is done, the entrance bee-feeder should be used. This will stimulate the bees to work, and usually in two or three days all the foundation is drawn out by them into full-depth cells, and the hive is soon filled with fresh worker-combs. The old hives from which the bees were drummed still contain some young bees, together with eggs and brood, which in twenty-one days from the day of transferring will have hatched into bees. At this period the old hives should be entirely cleared, and the bees should be united with those first drummed out. The combs from these old hives are next rendered into bees-wax by the use of the wax-extractor, and this wax should in turn be made into comb-foundation, to be used during the season. The rearing of plenty of bees in time for each honey-flow during the season is the main secret of successful management. The usual means of estimating the value of a stock is based upon its weight and the quantity of honey the hive contains; but the practical apiarist judges rather by the number of bees and the amount of brood in the hive. An excess of bees after the harvest is past is as bad as a deficiency of bees before the harvest begins. When a stock is very weak in May, and only becomes strong as the first harvest closes, it is often worse than useless, since the bees in this case act only as consumers, and will be old and ready to die by the time the next harvest opens. In early spring each hive should be examined, and those lacking honey should be fed from those having an abundance. This is effected by exchanging empty frames of comb from the deficient hives for those full of sealed honey.

As soon as pollen comes in freely, each hive should be again examined, and the combs that have brood in them must be changed in position so that those having the least brood are placed in the centre. The queen is thus incited to greater activity in stocking the defective combs with her eggs, and those combs which had the least brood soon have the most. About ten days later the hives should be gone over again. At this time the bee-master takes the combs containing honey from the outside of the cluster, and breaks the sealing to the cells by passing a knife flatwise over it. The brood-nest is next spread apart, and this unsealed comb is placed in the centre of it. This causes the bees to remove the honey, and during this process the queen receives an excess of food, which causes her to lay her eggs much faster than she naturally would; and in consequence this comb is soon filled with eggs. In this way the stock of workers is vastly increased. About a week later the same operation is repeated, the manipulator being careful to make sure that each colony has food to last two weeks, for if a less amount is on hand the bees will probably economize for fear of starvation, and the brood-rearing will not go on to its fullest extent.

If there is not honey enough in the hives to supply all the stocks by the above process, feeding by the following method should be resorted to: Make a box 3 feet square by 2 feet deep, and hang a pan 5 inches deep and close-fitting down in the box. Cut a doorhole in one side, and put lamps in under the pan. Put the feed in the pan, and a float on it, so that the bees will not sink or get daubed; regulate the lamps in such a way that they will keep the food at about 80° to 90° Fahr. Set the box in some sheltered place in the yard, and put some boards up to keep the cold winds from it. Every day when the bees can fly with safety have this feeder ready for their use, and mix the feed quite thin. Sap from the maple tree, with a little extra C sugar added, makes a good feed. The main point gained is this: that the bees fly from the hive and get their food in the natural way, and when they have filled their sacks with this warm food they are in as good condition for again reaching their hive as they were when leaving it; and, besides, thin hot feed promotes breeding much more effectively than honey. This pan will feed from sixty to eighty hives. The pan and float must be kept clean, and the feed must not be left to sour. This management makes a little summer for the bees just when it is most wanted.

The next time the hives are gone over most of the brood will be found hatched out of those frames placed at the outside; and these should be again replaced in the centre of the brood-nest. In a few days more the hives will be overflowing with bees and the combs will be full of hatching brood. If the object is simply surplus honey in the comb, the racks on the sides and the case on top of the hive should now be filled with section-boxes. The bees will begin at once to fill the side-racks, and as soon as these racks are about half full of honey they should be lifted into the top case, and their places supplied with racks with empty sections. This process should be repeated during the continuance of the honey-flow; and if the flow lasts for two weeks and is reasonably abundant, each hive should yield at least 100 pounds of honey. The boxes should be removed as fast as they are filled and sealed over; for if allowed to remain where the bees, covered with yellow pollen, are constantly crawling over them, the combs lose their delicate white color and have a yellowish appearance.

Sometimes when surplus comb-honey is removed early in the season, it contains eggs of the wax-moth, which in warm weather hatch and commence a work of destruction. To prevent this destruction, place the honey in a tight box, or if in quantities store it in a close room and fumigate with burning sulphur. This process should be repeated several times at intervals of some days, for the eggs do not all hatch at the same time, and the sulphurous acid has no effect on the unhatched eggs. During the summer, comb-honey should be kept in a warm, dry, dark room, and great care should be taken that ants and other insects do not prey upon it.

By the use of the honey-extractor about double the ordinary crop of honey may be obtained, and by exercising care the different varieties may be kept separate; and as it is taken from the cells without crushing the comb, all the delicate flavor of the flowers is retained.

If great care is not observed, the body of the hive may become so full of honey that the queen will have little or no room to deposit her eggs, and the hive may in consequence become depopulated to a great extent. This condition is seen with especial frequency when the Italian bee is kept. By extracting the honey and returning the empty comb this difficulty is effectually overcome. In fact, if the object is to secure the greatest amount of honey, and at the same time to leave the bees in the best possible condition, a judicious use of the honey-extractor must be made.

The work of extracting should be done quietly yet swiftly, and the greatest care should be taken not to leave any honey within the reach of robber bees. On approaching a hive, puff a few whiffs of smoke into the entrance in order to quiet the bees. Take off the cover and remove the combs containing honey (usually found on both sides of the brood-nest), and with a fine hand-broom brush off the bees, and place the comb in the carrier (shown in the engraving), shutting down the lid as promptly as possible. The hive also should be at once closed, and its entrance contracted. The carrier is taken to the extracting-room and the combs placed on a table. As soon as the combs are uncapped on both sides they are put in the extractor, care being taken that the combs placed opposite one another be of nearly equal weight. From 2000 to 3000 pounds of honey can sometimes be taken with a single machine in one day.

All the empty combs should be returned to the bees about sunset, and placed in the centre of the hive. This gives the queen a chance to fill two or three combs with eggs during the night, and the bees will have no opportunity to molest her by refilling them with honey. This process may be repeated until late in the autumn.

By thus continually depriving the bees of their stores, and replacing either with empty comb or frames and sections filled with foundation-comb, the bees, having ample room, are kept busy, and usually all desire to swarm is prevented.

Should a multiplication of colonies instead of surplus honey be desired, the apiarist proceeds as follows: Selecting some warm day about the hour of 10 A. M., when the bees are busy collecting honey, he divides two or three of his choicest stocks by opening the hive, taking out the frame which contains the queen, and placing it, with the adhering bees, in an empty hive. Then, taking another frame containing honey, brood, and eggs from the same hive, the bee-master sets it alongside of the first one, putting in two or three frames filled with comb-foundation. He now removes the hive from which the two frames have been taken to another place, about 5 feet distant and at right angles to the line of entrance, replaces the two frames removed by other frames containing comb-foundation, and sets the new hive containing the queen, with the two frames taken from the first hive, in the place from which that hive was first removed. All the old bees from the removed hive will return to their old location and enter the new hive, leaving the removed hive entirely to the young bees; and since the young bees never leave the hive until they are five days old, there will be enough left to cover the combs and keep them from the intrusions of the bee-moth.

From day to day frames of foundation should be added to the new hive, and a strong colony will soon be built up. The young bees in the old hive soon realize the absence of their queen, and at once commence to repair the loss by selecting cells of larvæ just hatched from the egg. There will be reared from twenty to thirty queens in each of the divided hives. Just ten days after this first division the whole apiary should be divided in the manner just described, but instead of letting the queenless parts rear their own new queens they are each given a queen-cell from the hives first divided. These cells in a day or two will hatch out, and all the hives will then have queens. The queen-cells are removed with a thin-bladed, sharp knife, and inserted in the queenless parts of the divided hives by making an opening among the eggs and larvæ in a comb near the centre of the hive, where the bees will cluster upon it and keep it warm. When practicable, about an inch square of comb should be taken with the cell, so as to avoid cutting or denting the royal occupant of the cell. This process saves ten days' time to each colony receiving a cell. By the use of comb-foundation, and by feeding during the intervals which are likely to occur between the blossoming of the plants depended on for honey, an apiary may be easily increased to five times the original number of hives, and all the colonies may at the same time be rendered strong and put into good condition to go into winter quarters.

The multiplication of colonies of bees by division is now practised by all our best apiarists, and what is termed "natural swarming" will soon be entirely superseded, as the advantages of the new system are many and important.

Wintering Bees.—In New England, Northern New York, Minnesota, Wisconsin, and Dakota bees are often kept through the winter in cellars entirely underground, and such cellars (or in other cases warm bee-houses) have given the most satisfactory results; while in Michigan, Ohio, Indiana, Illinois, Iowa, Pennsylvania, New Jersey, and Southern New York, double-walled bee-hives, when other requirements have been complied with, have with most bee-keepers met with more favor than either bee-houses or cellars. In that part of the winter belt of which Kentucky and Tennessee afford fair illustrations a straw, cotton, or wool mat 2 or 3 inches thick, placed upon the frames of shallow hives, renders the wintering of bees a matter of certainty; while in Alabama, Mississippi, etc., no special winter protection is required.

From 30 to 35 pounds of honey should be left in every hive for winter food. To ascertain the quantity in the hive, weigh it and its contents, and compare the result with the weight of a similar empty hive, allowing from 6 to 8 pounds for the weight of the bees, combs, and pollen. This honey should be of good quality, and all of it should be in cells perfectly sealed over; that stored in the early spring or summer is best. The bees also should be young and vigorous, or else they will dwindle away in early spring, by reason of age, before others are reared to take their places. If full frames of honey have been taken from the hives in summer for winter use, and the extractor and comb-foundation used as directed, all the hives may now be easily put in proper condition for successful wintering.

A cellar for this purpose should be dark, dry, and have a temperature of 40° Fahr. To keep the air pure, a pipe 3 inches in diameter should extend from the bottom of the cellar through the side-wall and up into the outer air to a distance of 20 to 30 feet. The caps should be removed from the hives and the frames should be covered with chaff cushions 2 inches thick.

If a bee-house is used, it should be 8 feet from floor to ceiling; the walls should be double and have a 10-inch space between, packed with dry saw-dust. The floor and ceiling should be packed in the same way. The windows should have tight shutters, so arranged as to admit straw cushions between them and the sashes. The doors should fit snugly, so that when all is closed no ray of light can be seen. A ventilator 8 inches square is cut through the floor in the centre, and as the floor is high enough from the ground to leave about 1 foot space, by leaving a brick out on two sides of the wall we have plenty of air without any light. A similar arrangement in the ceiling will complete the ventilating arrangements.

Wintering on summer stands, when properly conducted, is (all things considered) the most desirable and convenient method. To illustrate this we will take the chaff hive. Remove the top and side cases, and all the frames but six or seven; place these in the centre of the hive, and bring the two close-fitting division-boards snugly up against them on both sides; this leaves on each side of the brood-nest, between the division-boards and the walls of the hive, an air-space which may be filled with chaff cushions. Across the centre of the brood-frames place a strip of wood about an inch thick, over which stretch a piece of muslin as large as the frames. Upon this muslin covering a chaff cushion 4 inches thick should be placed; and this, together with the chaff sides, will completely protect the bees. Above the packing the hive admits a free circulation of air, which carries off all moisture.

The sides and ends of single-walled hives may be protected in various ways to secure warmth. The hives should be kept well down to the ground, the entrance being contracted to about 1 inch, for the bees to fly in and out at will, and the colony should be protected from the direct rays of the sun and from the driving in of wind and rain.

Enemies.—If colonies are kept strong by the methods here given, there will be little if any danger from ordinary enemies, such as toads, mice, ants, or the bee-moth, the latter being always a terror to the keepers of common black bees, particularly when kept in log gums or stationary-comb hives; but where Italian or Syrian bees are kept in modern movable-frame hives no fear need be entertained. Dysentery sometimes attacks the bees in early spring and sweeps away whole apiaries, but in most cases the cause is easily traced to defective wintering. "Foul brood," though of rare occurrence in this country, is justly dreaded by all bee-keepers acquainted with its ravages in Europe. It attacks the brood in the cells, and its germs may be carried by the bees to other hives, so that it sometimes produces great disaster before its presence is known. Foul brood may be detected by an offensive odor, perceived as soon as the cover of the hive is raised. The cells containing foul brood, instead of being oval, are depressed and of a dark-gray color, and on being opened the young bees will be found in a decomposed condition. No remedy sufficient to save the combs has yet been discovered, but since the disease is confined entirely to the brood, the bees may be saved by drumming them out into a clean box and leaving them without food for twenty-four hours, when all the honey in their stomachs will have been exhausted. The bees should then be driven into a clean hive filled with sheets of comb-foundation, and should receive feed composed of equal parts (by measure) of granulated sugar and water, adding half a teaspoonful of salicylic acid to each quart of this food, which should be fed at about 80° to 85° Fahr. The empty combs in the affected hive should be melted into wax, and those containing the foul brood burned up; and if the hive be used again, it should be thoroughly scalded out, and rinsed with a strong solution of salicylic acid and borax. (A. J. K.)

BEER. See BREWING.

BEER, ADOLF, an Austrian historian, was born at Prossnitz, in Moravia, Feb. 27, 1831. He was educated at the gymnasia at Pressburg and Pesth and at the universities of Berlin, Heidelberg, Prague, and Vienna. From 1853 to 1857 he taught in gymnasia at Czernowitz, Vienna, and Prague, and in the latter year was made professor extraordinary of Austrian history in the law-school at Grosswardein. From 1858 to 1868 he was professor of universal history in the commercial academy at Vienna, and since that time has been professor of history in the technical high school in Vienna. He took part in educational reforms for some years in organizing the school board, in the public-school law of 1869, in the reorganizing of scientific schools, and became a counsellor in the educational board; but on the overthrow of the Burgher ministry returned to his work as professor and author. He is a corresponding member of the Academy of Vienna and a foreign member of that of Leyden. He has made extensive journeys through the principal countries of Europe for the purpose of educational and historical research. His historical labors have been chiefly connected with the reigns of Maria Theresa and Joseph II. He has contributed to the *Archiv für österreich. Geschichte* and to Von Sybel's *Historische Zeitschrift*, and has published *Geschichte des Welthandels* (Vienna, 1860), *Die Fortschritte des Unterrichtswesens in den Kulturstaaten Europa's* (1867), *Aufzeichnungen Bentincks über Maria Theresa* (1871), *Joseph II., Leopold II., und Kaunitz; ihre Briefwechsel* (1873), *Friedrich II. und Van Swieten; ein Beitrag zur Geschichte der ersten Theilung Polens* (Leipsic, 1873), *Leopold II., Franz II., und Katharina von Russland* (1873), *Aus Tegethoffs Nachlass* and *Die Orientalische Politik Oesterreichs* (1880). He was associated with F. Hochegger in the authorship of *Die erste Theilung Polens* (3 vols., 1873).

BEETS, NICOLAAS, S. T. D., a Dutch poet, sketch-writer, and theologian, was born at Haarlem in 1814. He began the study of theology at Leyden in 1833, and took his degree as doctor of theology in 1839 with a thesis, *De Ænea Sylvio.* He had already entered on his poetical career by publishing in 1834 translations from Sir Walter Scott and Lord Byron, and by original poems in the manner of the latter—*Jose* (1834), *Kuser* (1835), *Guy de Vlaming* (1837). Though these were free from the taint of infidelity, he afterwards censured them as belonging to the "dark period" of his life. A favorable change may be noticed in his *Gedichten*, a volume of miscellaneous poems which appeared in 1838 (2d ed. 1855) and in the metrical romance of *Ada van Holland* (1840). In the latter year he became pastor of the Reformed church at Heemstede, a village near Haarlem, where he remained till 1854. In 1839 he had published under the name of "Hildebrand" a collection of short stories and sketches called *Camera Obscura.* This little work, setting forth Dutch manners and idioms in a humorous style, proved unexpectedly popular, and has been translated into French, English, German, and Italian. In 1842, Beets prepared a biography of the Dutch scholar and orator Van der Palm, of which an English translation was published at New York in 1869. In 1854 he became one of the pastors of the Reformed church in Utrecht. In 1865 he received the honorary degree of doctor of letters, and in 1869 was elected a member of the Royal Academy of Science. In 1875 he was made professor of theology in the University of Utrecht. During his residence in Utrecht he has continued to produce poetical, literary, and religious works. Besides several volumes of sermons, his chief religious work is *Stichtelyke Uren*, or *Hours of Edification*, first issued in annual volumes from 1848 to 1852, and again from 1859 to 1862, while an additional volume appeared in 1875. Selections from these writings have been published in Germany. He also published in 1853 a volume on St. Paul, *Paulus* (3d ed. 1859), which has been translated into German and Danish. His literary works comprise *Verpoozingen*, or "Refreshments" (1856; 2d ed. 1873), *Verscheidenheden*, or "Miscellanies" (1858–73; 2d ed. 1876). His later poems appeared in *Korenbloemen*, "Cornflowers" (1853); *Nieuwe Gedichten*, "New Poems" (1857); *Madelieven*, "Daisies" (1869). A complete collection of his poetical works in three volumes was published in 1873, and a second edition in 1878. Since that time another volume has been added, *Najaarsbladen*, "Autumnal Leaves" (1881).

BELFAST, the county-seat of Waldo co., Maine, is a port of entry on Belfast Bay, which opens into Penobscot Bay. It is 30 miles S. of Bangor, on the Belfast and Moosehead Lake Railroad. It has a court-house, Masonic temple, two large bridges, five hotels, a national bank, a savings bank, two weekly newspapers, five churches, and a high school and twenty other schools. It has a foundry, saw- and grist-mills, two sash-and-blind factories, ship-yards, and manufactures of leather, ships' blocks, and clothing. It has an attractive appearance, being on the side of a hill overlooking a fine harbor. It was settled in 1770 by persons of Scotch-Irish descent from Londonderry, N. H., and was incorporated as a city in 1853. It was at one time noted for ship-building, and this industry is now reviving. Its property is valued at $2,465,000, its public debt is $700,000, and its yearly expenses are $81,300. In the neighborhood are some popular summer resorts. Population, 5308. An interesting history of the city, by Dr. Joseph Williamson, was published in 1877.

BELGIOJOSO, PRINCESS OF, CRISTINA DI TRIVULZIO (1808–1871), daughter of the marquis di Trivulzio, was born in Milan, June 28, 1808. She was educated in part by Manzoni. She married in 1824 the prince Emilio di Barbiano e di Belgiojoso. The marriage was not happy. Springing from a Guelphic family, and thus by inheritance very liberal in her ideas and enthusiastic in her love of Italy and of liberty, she was not willing to reside at Milan under Austrian rule. She therefore, after brief sojourns in Florence, Rome, and Naples, went to Paris, where her rank, fortune, love of letters, and pronounced political opinions caused her society to be sought by men of culture. La Fayette was her constant visitor, and among literary men the historians Mignet and Augustin Thierry were her particular friends. In the year 1846 she wrote a work entitled *Essay on the Formation of the Catholic Dogma*, which displayed power of thought and felicity of diction. In 1848, urged by patriotism and principle, she joined heartily in the revolution in Italy, hurried to Milan, and herself raised a battalion of volunteers; but the victories of Radetsky dashed the hopes of the revolutionists; she was obliged to fly for her life, and all her property in Italy was confiscated. Returned to Paris, she wrote articles of a liberal character for various journals. Later she travelled in Greece, Turkey, and Asia Minor, and published the account of her journey in numbers of the *Revue des Deux Mondes*, and afterwards in volumes, entitled *Asia Minor and Syria* and *Scenes in Turkish Life*. These appeared in 1858. In 1860 appeared her *History of the House of Savoy*, and in 1869 her *Reflections upon the Present Condition of Italy and its Future*. She was the author of several novels, one of which, embodying her observations in Eastern travel, was entitled *Emina; or, Turko-Asiatic Narratives*. Upon the proclamation of an amnesty by the emperor Francis Joseph her property was restored to her. She continued to write as long as she lived, and was an ardent student of science, especially mathematics, which she studied with Arago. The princess died at Milan on the 5th of July, 1871. (H. C.)

BELGIUM. In this article we give only a sketch of the present condition of this kingdom, which now ranks among the countries of Europe as the seventeenth in area and the ninth in population. In the statistics, wherever the year is not specified, the reference is to 1880.

See Vol. III. p. 443, Am. ed. (p. 514, Edin. ed.).

Population.—At the formation of the kingdom in 1830 the population was 3,785,814; in 1870 it had increased to 5,087,826, and in 1880 to 5,519,844, of whom 2,758,413 were males and 2,761,431 females. On Dec. 31, 1881, the population was 5,585,846. The population of the nine provinces was as follows in 1880,—Antwerp, 577,232; Brabant, 985,274; East Flanders, 881,816; West Flanders, 691,764; Hainault, 997,765; Liége, 663,735; Limbourg, 210,851; Luxembourg, 209,118; Namur, 322,654. The principal cities are Brussels, containing (with its suburbs) 377,084 inhabitants; Antwerp, 169,112; Ghent, 131,431; Liége, 123,131; Bruges, 44,801; Malines, 42,381; Verviers, 40,944; Louvain, 35,893; Tournay, 32,566. Belgium is the most densely populated country of Europe, having, on an average, 490 inhabitants to the square mile; yet the density varies greatly in the different provinces, reaching an average of 775 in Brabant and 758 in East Flanders, while in Limbourg it sinks to 224 and in Luxembourg to 121. The births were 171,864 (males 87,782, females 84,082, still-born 8060); the deaths were 123,323; showing the excess of births 48,541. Of the births 13,284 were illegitimate, or more than one-twelfth; the ratio varies in the different provinces, being greatest in Brabant and least in Luxembourg. There was one birth to every 32.2 of the population, and 139 births to 100 deaths. The number of deaths under one year was 32,058; between one and five years of age, 16,139. The deaths by accident were 2104; by murder, 100; by suicide, 591. The number of marriages was 38,926. As has been the case for several years, there was a slight increase in population due to immigration, there having been 16,490 immigrations and 15,064 emigrations.

Government.—Belgium is a constitutional monarchy, with exclusively male succession, according to the constitution of Feb. 7, 1831. The present king, Leopold II., was born April 9, 1835, being the eldest son of the first king, Leopold I., at whose death, Dec. 10, 1865, he succeeded to the throne. He was married Aug. 22, 1853, to Marie Henriette, daughter of Archduke Joseph of Austria, and has three daughters. The heir-apparent to the throne is Philip, Count of Flanders, brother to the king, born March 24, 1837, and now lieutenant-general of the Belgian army. He was married April 25, 1847, to Princess Marie, younger daughter of Prince Charles Antoine of Hohenzollern-Sigmaringen, and has two sons and two daughters. The elder son, Baldwin, duke of Saxony, was born at Brussels June 3, 1869.

The king's cabinet consists of seven ministers, appointed and dismissed at his pleasure; their departments are respectively foreign affairs, justice, finance, war, the interior, public instruction, and public works. The legislative power is exercised jointly by the King, the Senate, and the chamber of representatives. The chamber is composed of 138 deputies, elected for four years, one-half the number being elected every two years. The Senate always contains one-half as many members as the chamber, and these are elected for eight years, one-half being elected every four years. The members of both branches of the legislature are elected directly by all citizens that pay annual taxes to the amount of 20 florins (about 8 dollars). In 1882 these electors numbered 118,626, being 2·145 per cent. of the population. A representative must be at least 25 years of age, a senator 40, and the latter must pay an annual tax of 2116 francs (nearly $424). An annual list is prepared of those that are thus eligible; in 1881 the number was 511. Each province has a governor, appointed by the king, and a council, the number of members of the latter varying in different provinces. All citizens paying 10 florins annual tax have the right of voting for these, and there are 236,290 provincial electors. There are also communal councils with considerable power over local affairs. The requirements for electors to these councils are still lower than for those to the former, and in 1882 there were 382,569 persons qualified, being nearly 7 per cent. of the population.

Religion.—Almost the entire population is Roman Catholic, though liberty is granted to all in religious matters, and the ministers of all denominations are paid by the State. In 1881 the amount appropriated for this purpose was 4,720,690 francs, of which Roman Catholics received 4,632,400, Protestants 74,958, and Jews 15,292. The number of Protestants is estimated at 15,000, and that of Jews at 3000.

Education.—Important changes have been made in recent years with regard to education. The law of 1879 directs that there shall be at least one primary school in every commune, except where the Government judges that one school may serve for two or more communes, and the Government determines the number of primary as well as of infant and adult schools necessary in each place. In these schools instruction is given in reading, writing, elementary arithmetic, the metric system, the rudiments of the language spoken in the vicinity, whether French, Flemish, or German, the outlines of geography and national history, the elements of the natural sciences, drawing, music, and gymnastics; and girls are taught needle-work. Moral instruction is also given, but religious instruction is left to the care of parents and to the clergy of the different denominations, who may give it in the school-building before or after the usual hours on demand of the parents. The communes are required to give gratuitous instruction to all children whose parents cannot afford to pay for their education. The primary schools are under the oversight of the communal authorities, the government inspector and school-boards chosen by the commune, or by the general government. Each province has a general inspector of primary schools, who is appointed by the king, and inspects, at least once in every two years, each communal school in his district. There are also cantonal inspectors, who are required to visit each school at least twice each year. A *conseil de perfectionnement* of primary instruction, under the presidency of the minister of public instruction, discusses the methods of teaching and selects the text-books to be used. In 1878 there were 4376 communal schools, 444 schools adopted by the State, and 19 inspected private schools; there were 890 other private schools, making the total number of primary schools 5729, with 687,749 scholars (351,437 boys, 336,312 girls), or 12.6 per cent. of the population. At the inspected schools there were 597,624 scholars, and at the non-inspected 90,125. Nearly four-fifths of the pupils attending communal schools received gratuitous instruction, and many of them received also food and clothing; more than two-thirds of those in the adopted schools were taught gratuitously. There were in all 6166 male teachers and 5642 female. Besides the primary schools there were also schools for children under six years of age, of which 394 were communal, 334 private schools inspected, and 401 non-inspected, making a total of 1129 infant schools, with 124,031 scholars. Though there would seem to be ample provision for primary instruction, yet, out of 49,095 persons examined for the militia in 1881, there were 7707 unable to read or write, 1612 could read but not write, 22,609 could do both, and 16,288 had received higher education. To remedy these defects schools for adults have been established, and in 1878 there were 2747, with 228,563 scholars (120,876 males, 107,687 females), most of whom were taught without charge. There were also, in connection with hospitals, prisons, etc., 100 other schools, which gave instruction to 7151 scholars. The expenditure for primary instruction has been greatly increased; in 1873 it was 18,076,635 francs, while in 1878 it was 28,413,053, of which 1,892,970 were the school fees received, 674,103 public or private donations, 10,583,664 contributed by the communes, 3,050,052 by the provinces, and 11,843,797 by the general government.

The middle schools comprise the royal athenæums, the state schools, and the communal schools, which are of two grades. The course in these schools extends over three years. The following table gives some statistics for the year 1880:

	Communal.		State.	Athenæums.
	Lower grade.	Higher grade.		
Number of schools . .	19	18	50	10
" " students . .	2549	1681	9,358	4,031
Support received from the state	225,832 francs.		596,188	655,532
Support received from the communes . . .	363,607 "		238,561	316,677

About one-eighth of the students were in preparatory classes, and the rest were nearly equally divided between those pursuing liberal studies and those taking a professional course. The latter is divided into three sections, commercial, industrial, and scientific. The law of 1881 requires that there shall be at least nineteen athenæums, and in 1882 the actual number was twenty-five. Another law of the same year requires that there shall be at least 100 state middle schools for boys and 50 for girls.

For higher education there are the state universities at Ghent and Liége, the free University at Brussels, and the Catholic University at Louvain. The number of students in 1881 was as follows: Ghent, 656; Liége, 1161; Brussels, 1239; and Louvain, 1512.

There are also six state normal schools and one adopted school for primary teachers, six state and four adopted normal schools for female teachers, and in connection with middle schools there are six normal primary sections. The course extends over three years, in the last of which the pupils have practice in teaching. There are also several private normal schools, especially episcopal schools.

Of schools or colleges for instruction in special branches may be mentioned the navigation schools at Antwerp and Ostend, which prepare officers for merchant vessels; the military school at Brussels, with 273 pupils, and that at Alost for the sons of soldiers, which had 330 pupils; the agricultural school at Gembloux, with 76 students; the horticultural school at Ghent, with 27 students, and that at Vilvorde, with 26; the veterinary college at Brussels, with 93 students. There were also 82 academies and schools of design, with a total of 12,212 pupils; the Royal Academy of the Fine Arts at Antwerp, with 1692 students; the Royal Conservatory of Music at Brussels, with 1004 scholars, and the conservatory at Liége, with 1073 scholars, and 108 other musical schools, with 8168 scholars. Industrial instruction has attracted considerable attention in recent years, and there were 33 such schools, with 9293 pupils. The manufacturing schools, intended chiefly for girls, in 1878 comprised 66 communal schools, with 1954 scholars, 118 private inspected schools, with 6706 scholars, and 209 schools not inspected, with 10,915 scholars, making a total of 19,575 scholars, of whom 17,631 were females.

The number of prisoners in the central state prisons was 1647, in the reformatories 647, and in the provincial prisons 3011. The workhouses had 2851 inmates, and the lunatic asylums 8165 patients, of whom 6389 were paupers.

Army.—The infantry consists of 19 regiments, of which 14 are of the line, 3 of chasseurs, 1 of grenadiers, and 1 of carabineers. It contains 1676 officers and 25,677 men in time of peace, and 52,200 on war footing. The cavalry consists of 8 regiments, 4 of lancers, 2 of chasseurs, and 2 of guides. It contains 296 officers and 5680 men in time of peace, increased to 6080 in time of war. The artillery consists of 7 regiments, 4 of field and 3 of siege. It has 466 officers and 7559 men. There is 1 regiment of engineers, with 135 officers and 1571 men, increased in war to 3600 men. There are 23 officers and 377 men engaged in transportation, but in war this number is increased to 1892 men. To the foregoing must be added 33 generals and 573 officers engaged in various service. The total effective force of the army in time of peace is 46,272 men, 10,014 horses, and 204 cannon; in time of war, 103,683 men, 13,800 horses, and 240 cannon. The civic guard in 1881 amounted to 30,954 men, with a reserve of about 90,000 men.

Agriculture.—The total amount of cultivable land in Belgium is 2,663,700 hectares (6,582,120 acres), of which 485,000 hectares are covered with woods, 435,000 are moorland, and 1,743,000 are cultivated. About one-half is leased to tenants, the other half remaining in the hands of the owners; yet the ratio varies greatly in the different provinces, four-fifths of the land in Flanders being cultivated by tenants, while in Luxembourg only one-fourth is leased. The farms are generally small, there being altogether 744,000. Of these 56·5 do not exceed one hectare (2·5 acres), 36·5 per cent. do not exceed 10 hectares, and only 7 per cent. are of greater extent. In consequence of this excessive division and the cheapness of labor, machinery is but little used on farms, yet they are well cultivated and highly profitable. The average yield of wheat or rye is 24 bushels per acre. The average value of arable lands is 4173 francs per hectare, the average rent 108 francs, varying from 44 in Luxembourg to 135 in Hainault. The daily wages of agricultural laborers vary from 1·50 francs (30 cents) in Flanders to 3 francs (60 cents) in manufacturing districts. About one-fourth of the population is engaged in agricultural work, and one-third of the laborers are women. Much improvement has been effected in recent years by agricultural societies, there being at least one in each province; under their auspices fairs and exhibitions are held, at which there are competitions for prizes. Lectures are delivered and periodicals published in the interest of these societies.

Mining.—In 1881 there were 270 coal mines in Belgium, employing 101,351 persons and producing 16,874,777 tons of coal, valued at 163,704,243 francs. In the iron, lead, and zinc mines there were 2650 persons employed, and the product was 3741 tons of lead, 8769 tons of blende, 15,384 tons of calamine, and 205,000 tons of puddled iron. The production is diminishing yearly, and the iron-works in 1881 imported 1,325,000 tons from the grand duchy of Luxembourg, Spain, Algeria, etc.; of zinc ores 145,933 tons were imported from Greece, Spain, Sweden, etc.; of lead ores 8000 tons were imported from France, Sardinia, and Greece. The mines are under the superintendency of a corps of mining engineers appointed by the minister of the interior. They are divided into two divisions, Liége and Mons, and ten arrondissements, each of which includes two or three mining districts.

The establishments for the working of minerals, etc., in 1881, comprised iron-works, 317; steel, 3; zinc, 23; lead, 5; copper, 5; alum, 1; glass, 66. In these works 39,782 men were employed. The value of the iron and steel manufactures was 154,000,000 francs; zinc, 37,000,000; glass, 36,000,000; copper, 4,000,000; lead, 3,000,000. The production of the metallurgical works was pig-iron, 631,000 tons; rolled iron, 593,000; steel ingots, 141,000; rolled steel, 118,000; spelter, 69,800; lead, 7,650. There were also 1729 marble quarries, employing 27,326 men, and producing to the value of 38,672,000 francs.

Manufactures.—The most important textile manufacture is that of flax, and, besides the raw material raised in the country, a large amount is imported. The cotton manufacture is important, especially in Ghent, and the centre of the woollen manufacture is Verviers. Wool is imported chiefly from the Argentine Republic, Australia, Cape Colony, and Prussia, the native produce being small. The following table shows the value of the imports and exports for 1881:

	Imports.	Exports.
Flax	60,828,000	62,537,000
Hemp, tow, jute, etc. .	31,660,000	. . . .
Flax and hemp yarns .	14,980,000	55,268,000
" " " cloths .	. . . .	19,772,000
Cotton	36,550,000	. . . .
" yarn	3,865,000	4,960,000
" cloths	73,933,000	23,927,000
Wool	177,484,000	15,704,000
Woollen yarn	11,430,000	73,987,000
" goods	23,927,000	37,383,000

The other manufactures comprise lace, silk, glass, paper, leather, sugar, beer, distilled liquors, vinegar, etc. The excise duties in 1881 on sugar amounted to 8,903,170 francs, on foreign wines 4,389,141 francs, on beer and vinegar 15,057,667 francs, and on distilled liquors 26,437,987 francs.

Commerce.—The following table shows the number and tonnage of the steam and sailing vessels entering and leaving the ports of Belgium in 1880 and 1881:

	Entered.		Left.	
	Vessels.	Tonnage.	Vessels.	Tonnage.
In 1880	6667	3,571,182	6615	3,544,964
" 1881, steam .	4072	2,733,603	4062	2,711,055
" " sailing	1876	628,961	1708	620,043

The following table shows the number and tonnage of vessels from and to the different countries in 1881:

	Entered from.		Left for.	
	Vessels.	Tonnage.	Vessels.	Tonnage.
England . . .	3065	1,182,330	3961	1,998,352
United States .	496	618,114	361	518,137
Russia	444	363,243	120	65,495
Germany . . .	348	213,561	163	129,416
Argentine Rep'c	114	164,626	37	49,165
Sweden-Norway	534	150,055	291	90,074
India and China	75	127,683	. . .	. . . . . .
Spain	211	120,953	142	88,872
France	246	113,166	162	66,085
Italy	. . .	. . . .	51	53,233

The following table shows the value (expressed in millions of francs) of the imports from and the exports to the different countries in 1881, and of the goods in transit.

	Imports.	Exports.	In transit from.	In transit to.
France	335	414	200	283
Holland	245	160	98	118
England	240	254	196	153
Germany	229	250	380	371
United States . .	223	42	. . .	62
Russia	118	11	. . .	. . .
South America . .	83	41	174	. . .
Asia	52	. . .	. . .	. . .
Spain	. . .	28	. . .	. . .
Italy	. . .	28	. . .	. . .
Switzerland	. . .	24	49	76

The official chambers of commerce and the upper council of industry and commerce have been abolished in Belgium, but in the principal cities there are free commercial associations, which represent the interests of trade. These present to the government their views on the commercial and industrial prosperity of the country, and make annual reports concerning their respective districts.

Railroads and Canals.—The total length of the lines in operation at the beginning of 1881 was 4112 kilometres (2570 miles), of which 2792 belonged to the state, and 1320 were conceded to companies; of the former 1534 were double-track. The cost of construction has been 1,143,000,000 for the state lines, and 414,000,000 for the companies' lines. The gross receipts were 113,000,000 francs for the former, and 38,000,000 for the latter; the net receipts 45,000,000 for the state and 11,000,000 for the companies. The transportation was 56,000,000 passengers, and 33,000,000 tons of freight. The rates are the lowest in Europe. Of other roads there are over 4000 miles maintained by the state, besides those maintained by the provinces and communes. There are thirty-two canals, whose entire length is 589 miles. The principal are the maritime canals from Ghent to Terneuzen, from Ghent to Bruges and Ostend, from the Rupel to Brussels and Louvain. The total length of navigable rivers and canals of Belgium is 1256 miles, of which 832 are open to vessels of 225 tons, the rest being smaller. The sea-coast of Belgium is only 41 miles.

Postal and Telegraphic Statistics.—The total number of letters passing through the post-office was 73,419,000; newspapers, 71,830,000; printed matter, 36,673,000; postal-cards, 18,116,000. The telegrams sent to different parts of the country were 2,031,426; to other countries, 1,035,665, besides 356,724 in transit.

Revenue and Expenditures.—The following table shows the annual ordinary revenue and expenditures in recent years:

	Income, francs.	Expenditures, francs.
1870, . . .	190,537,002	191,843,000
1875, . . .	248,529,000	247,058,000
1876, . . .	257,011,000	249,749,000
1877, . . .	258,850,000	261,374,000
1878, . . .	261,770,942	265,894,806
1879, . . .	272,653,147	273,606,473

The details of the revenue and expenditure for the last two of these years are shown in the following table:

Revenue.		
	1878.	1879.
Land tax, ...	21,934,285	22,294,355
Personal tax, ...	15,259,577	15,340,757
Trade licenses, ...	5,796,700	6,839,852
Rent of mines, ...	341,331	305,159
Customs duties, ...	17,965,699	18,966,896
Excise duties, ...	29,929,222	32,707,038
Stamp duties, etc., ...	53,270,258	53,364,194
Post-office, ...	8,745,622	9,049,814
Railways, telegraphs, ...	98,091,737	98,859,506
Miscellaneous, ...	15,436,511	15,925,575
Ordinary revenue, ...	261,770,942	272,653,147
Extraordinary revenue (Loans, etc.), ...	106,819,519	80,310,693
Expenditure.		
	1878.	1879.
Public debt, ...	77,488,110	79,035,033
Civil list, ...	4,526,106	4,699,073
Justice and religion, ...	15,815,278	16,801,937
Foreign affairs, ...	1,894,804	2,086,088
Interior, ...	9,160,522	9,381,963
Public instruction, ...	12,387,307	14,311,231
Public works, ...	81,245,087	84,200,314
War, ...	46,769,269	46,533,503
Finance, ...	15,119,659	15,078,336
Remitted taxes, ...	1,628,664	1,478,995
Ordinary expenditure, ...	265,894,806	273,606,473
Extraordinary expenditure (Public works, railways, etc.), .	83,582,952	70,032,543

The public debt of Belgium at the end of 1880 amounted to 1,422,814,000 francs.

Recent Political History.—The clerical party came into power in Belgium in 1870, having the cabinet and a majority in both chambers, and since that time every election has been fiercely contested between the clericals and the liberals. The majority of the former in the chambers was somewhat reduced in 1874, and after the elections of 1876 they were compelled by public opinion to pass a law guaranteeing the secrecy of the ballot. Under the working of this law in 1878 the liberal party obtained a majority in both chambers. A new cabinet was formed under the presidency of M. Frère-Orban, which has been sustained by the elections of 1880 and 1882. The ministry has been chiefly engaged in developing and improving the department of public instruction, which has been separated from that of the interior. The law of July 1, 1879, reorganized primary instruction, making it secular, and religious instruction has been removed from the programme of the public schools. The number of these schools, as well as of normal schools, has been greatly increased. The law of June 15, 1881, has reorganized the middle schools, and has provided for the creation, at the expense of the state, of a certain number of new athenæums and schools for boys and girls. The law of 1879 was attacked with great violence by the ultramontane party; the non-sectarian schools have been interdicted by the clergy, and many private schools have been opened by them. The bishops have pronounced excommunication against the teachers and the parents of children taught in the public schools, and in some parts of the country these schools have been deserted. The legislative chambers ordered an investigation into the matter, which established these facts.

The strife between the clerical and the liberal party extended also to diplomatic questions. Until 1878, the ministry had maintained an embassy at the Vatican, in spite of the opposition of the liberals and especially of M. Frère-Orban, and when the latter took charge of foreign affairs he made arrangements to recall the Belgian envoy. Pope Leo XIII., soon after his accession in 1878, seemed to indicate that he would pursue a more moderate policy than his predecessor, and would not approve the extreme measures adopted by the bishops in regard to the educational question. A discussion of the subject between the Belgian government and the Holy See followed, but when the latter finally sustained the bishops, the envoy was recalled in 1880.

The fiftieth anniversary of the national independence was celebrated by a succession of brilliant spectacles in Brussels in the summer of 1880. A grand exhibition of industry and art was also held, which was confined to Belgian productions. Similar exhibitions were held in the following year in the principal cities of the provinces.

[Note.—The above article is prepared under the supervision of Emile Laveleye, of Liége, Belgium.]

BELL. Acousticians commonly speak of a bell as though it were a concave disk; but experiments with a violin bow on very thin glass finger-bowls, gongs, and small bells prove that they each possess peculiarities that distinguish them from each other and particularly from large church bells; which fact must not be overlooked in the attempt to understand the acoustics of these instruments. A large bell varies considerably in thickness at the waist and soundbow. It is therefore obvious that the laws respecting plates of uniform thickness will not immediately apply to bells of this description.

See Vol. III. p. 463, Am. ed. (p. 536, Edin. ed.).

It is better perhaps to regard the bell as consisting of an infinite number of rings of various dimensions, and having their centres in a common axial line; and its tones as the products of their motions, reciprocated, combined, and opposed. But as yet it must be confessed that the nature of the sound of the deep-toned church bell is little understood. The study of bells presents certain problems which have long puzzled investigators of physical phenomena. Before giving details of some of these, it will be advantageous to illustrate this part of the subject by contrasting a bell with an ordinary tuning-fork.

On striking a fork upon a table to set it in vibration the note given out at the instant of percussion vanishes so quickly that it does not intrude upon the attention when the fork is mounted on a sounding-board to elicit its true note. But in the case of a bell the various attendant tones once generated continue to sound for some time with full force.

On testing forks it will in many cases be found that their overtones vary indifferently. If the fundamental tones are uniformly "A," the first overtone obtained may be "E," or "F," or some other note about two and a half octaves above the "A." If any attempt is made to cause the forks to agree with respect to the pitch of this overtone, they will be found to differ as regards the pitch of their fundamentals. The attendant tones of bells also vary, and similar difficulties attend their investigation. Although the American lathe (Jones's patent) cuts a bell very neatly at any given point in such a way as to remove excess of thickness, and thus supersedes the old and clumsy mode of tuning by hacking out metal and thus destroying the symmetry of the bell, yet the lathe does not enable the founder to tune the attendant tones.

Some of these secondary tones are lower than the primary, and therefore we cannot speak of them as overtones. At Trinity Church, New York, some of the bells have their strongest secondary tones above, and others have them below, their primaries. The words "primary tone" must be understood to refer to the note that is obtained at the very instant of percussion, when the bell is struck with a metal hammer at the soundbow. This must be considered the fundamental note. It is the tone quoted in the catalogue of the bell founder, and is the most prominent tone heard when the bell is sounded in succession with other bells, and when the auditor is at a fair distance. On the other hand, the note obtained by percussion from a tuning-fork is not its true note. The attendant tones of bells (when not brought out by percussion at points other than the soundbow) resemble the true notes of forks as regards quality; while the true notes of the bell resemble the overtones of the fork in this particular. It is, however, often difficult to judge properly regarding the attendant tones of a bell; for the ear and nervous system may be so powerfully affected by the energy of the tones sent forth by a bell of 5000 pounds' weight when the observer stands near by as to make it difficult to reason with sufficient promptitude upon the sensation received. While the experimenter is deliberating, the attendant tones form and increase in strength, and the primary one becomes fainter. For this reason a musical artist, trained so as to have keen perceptions respecting delicate variations in tone, is stunned or bewildered by the sounds. Even persons that may be called callous in this particular find their ears becoming jaded and their feeble ability to discriminate growing weaker still. If an investigator hopes to learn the peculiarities of a large bell by tapping it gently by the hand in its most sensitive part, the rim, or by striking it elsewhere with a padded drumstick, so as to elicit tones of a calmer and more agreeable nature, he will probably be altogether disappointed. The bell thus struck does not sound below its true pitch, as an organ-pipe excited by insufficient wind may speak flat; but the true note of the bell may speak with such faintness as not to be heard or noticed at all. The experimenter might naturally assume that the note the bell sustained longest and gave out on the least provocation and was deepest in pitch was the fundamental sound; but this is never the case.

In wind or stringed instruments greater physical or mental effort is required to bring out the harmonics than to produce the fundamental. And reasoning from analogy one would not expect to find any auxiliary note lower than its primary. In certain experiments conducted by the writer, a bell struck in the shoulder yielded "C" of the treble stave as its strongest note; when the blow was delivered at the soundbow it gave out "G" a fourth below; the sound obtained from the waist was "E," a third lower still, which was then its strongest note. On all occasions a deeptoned "A" was heard. Both the "A" and the "E" were heard 200 feet away, even after the "G" had become faint. There were no beats so detached by comparative silences that their rapidity might be estimated; but there was observed a certain striving or running together of interlaced and irregular waves of tone. The bell used in this experiment had a diameter of 42 inches, and weighed 1500 pounds, and "G" was its catalogue note. The notes obtained from a smaller bell struck in similar ways were "D" of the treble clef from the shoulder; "A" the fourth below from the soundbow; and "F sharp" from the waist; meanwhile there continued to sound a low "C." This bell weighed 1000 pounds, had a diameter of 37 inches, a vertical height of 24¾ inches, and the "A" was its true note. There were no beats heard, but only a running sound as before.

In these illustrations it must be understood that the tones obtained from different parts of the bells were attended by the tones obtainable from the remaining parts, with the one exception to be noted; and also that when a bell was struck elsewhere than at the soundbow, the note due to the soundbow had the effect of a secondary tone as regards power, quality, and other characteristics. It rendered a prolonged vowel tone like all the other attendant tones; while the note of percussion had the character of an admixture of consonantal sounds.

A bell of less dimensions gave out a note between "D sharp" and "E" when struck in the shoulder. The soundbow answered with "B" of the treble stave, a fourth below; and the waist with "G sharp," a minor third lower. The sustained bass note was "C sharp." This bell weighed 600 pounds, was 31 inches in diameter and 22 inches in vertical height; and the "B" was its true note.

On testing a number of "high D" bells, it was found that, being smaller than the "B," they gave out no musically definable note when struck in the shoulder; "D" was produced from the soundbow, and "B" the minor third below from the waist. The low note emitted by these bells was uniformly "E." The vertical height of each was 18¼ inches and the diameter 27 inches. In one bell only were the beats so distinct as to enable one to note their periodicity; and even in this case they were not checked suddenly. When this peculiarity occurs it is generally best to condemn the bell and recast it. With the exception of this one bell, which gave about two beats per second, all the bells had the general peculiarities of the one first tried.

Other phenomena presented themselves which seemed to defy explanation. The bells tried were American products.

In order to point to the danger of too hasty generalization in such matters, it is well to give some results obtained from the bell of the Old Dutch Church at the corner of Forty-eighth Street and Fifth Avenue, New York city. This bell was cast by Muller, of Amsterdam, in 1731. It is probably a specimen of the style of bell found in the highly-praised Belgian rings, the inscriptions on which prove that they came from old foundries in Amsterdam, Rotterdam, Zutphen, etc., where during five centuries carillons have been carefully studied.

On percussion this bell gives out a rather unsatisfactory "E" sharp from the shoulder, and this is changed to "F sharp" when the bell is struck in that portion of the circumference that is over the word "York" of the inscription. In the matter of wavering and uncertainty here, this bell agrees with the "B" bell just noticed. The waist yields the same "F sharp," and the note obtained from the soundbow is "C sharp" of the treble clef a fourth below. Meanwhile a low "D" is heard. When the bell is swung or tolled in the ordinary manner beats are heard occupying about $\frac{1}{54}$th of a minute. These are not detached, but flow in long unbroken waves, giving a waxing and waning effect. "C sharp" comes out strong and clear at the instant of percussion; but, strange to say, it is attended by a new note, an "E natural," a minor third above. There is also a very slight suspicion of an "F sharp," a fifth below; while, singularly enough, the high "F sharp" is silent or unheard; and there is a very strong "D" sounding as a bass.

Hence it is seen that bells do not merely give out overtones, but lower tones as well; and particularly that these are not all arranged in a cluster around the primary; for one note is always isolated and belongs to a lower octave.

It is very singular that authors do not draw attention to this phenomenon; for even persons whose sense of hearing is not musically cultivated, and who fail to analyze the compound tone of a single bell, often notice that when a bell is being tolled, a deep bass note sounds continuously.

A bell which was rung some twelve years ago, before Sunday evening service, at All Saints' Church, Margaret Street, London, produced a note about a twelfth below the real tone of the bell. This note was sustained with uniform energy; that is to say, it was not louder at the moment of percussion, nor softer some time after. This fact sometimes led persons in the church to suppose that a pedal key of the organ was fastened down, while a pipe was being adjusted.

It may well be assumed that this low note or "bourdon" is a "difference tone." For in the "G" bell of the experiments noted, the union of the "E" and "G" formed a minor third in the ratio of 6 : 7, as between the sixth and seventh overtones of a string having respectively 343 and 400 vibrations per second. The difference 57 is the vibration number of "A." In the "A" bell the minor third "F sharp" and "A," being more nearly in the ratio of the minor third, and in the ratio 5 : 6, as between the fifth and sixth harmonics of a string, and having respectively 376 and 442 vibrations per second, the difference 66 represents the vibration number of "C." In the "B" bell, the minor third "G sharp" and "B" (6 : 7) having respectively 432 and 504 vibrations, the difference 72 agrees with the vibration number of "C sharp." The "D" bells, all having the minor third "B" and "D" (6 : 7), and giving the note "E," in like manner strengthen the evidence, so as to render it almost conclusive. But the "D" of the Dutch bell cannot be accounted for by any known laws, and this bell in this particular affords a standing contrast to American bells, as well as in yielding a higher note from the waist than from the soundbow. For American bells give out higher notes from the soundbow than from the waist. That of the Church of the Holy Communion, New York city, being tapped with an umbrella in the shoulder, gave out "B" of the treble stave; in the soundbow, "F sharp" below; and in the waist, "D sharp" lower still. On striking it in the lip with the soft part of the fist it gave out the bass note "G sharp." But irrespective of the testimony of the Dutch bell it must be remarked that the bass notes formed by American bells are uniformly one octave higher than the difference tones generated by nature.

While experimenting on bells it is necessary to remember that the proximity of other bells may obstruct, interfere, or cancel tones by action on the sound waves, in accordance with the known laws of acoustics. A bell placed in the middle of a cluster will appear to be relatively weak on all sides, and each one of the bells around it will appear to be stronger from one particular side. Sheet-iron, broken glass, or any portion of the wood or metal-work of a church tower, free to move, may vibrate in sympathy with bells, and thus produce musical notes that may bewilder the experimenter. The spruce floors and ceilings often act as sound-boards, and the towers themselves may vibrate to such a degree as to become unsafe. The loose action of the bell-mountings and the absence of friction-wheels are among the various causes which may set up motions producing sounds and sometimes causing the disintegration of towers. Bell towers were invented for bells, but modern architects frequently make slight fanciful erections too small and weak for a collection of bells, and with little facility for the exit of their tones.

After experimenting on many bells and finding none that are completely satisfactory, one is led to the belief that an ideally perfect bell is rarely if ever cast, and that if one is ever produced it is as if by mere accident. A perfect instrument should produce a mono-polytone, the ratios of the vibration numbers of whose sounds would be 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10, or a selection from these, either 2 or 4 being most prominent; whereas in the Dutch bell noticed above the proportions 4 : 10 : 15 : 18, and in other New York bells 5 : 12 : 15 : 35, and other still more irregular compounds are found. These facts give us an illustration of the inharmoniousness of ordinary bells. The various tones refuse to coalesce or to shade off into one another, but each tone stubbornly maintains its individuality.

It has been said above that a church bell is not a gong. A gong loses its special characteristic as regards tone when it is more than 24 inches in diameter, and is of very inferior quality when as large as 19 inches. But on the other hand a small church bell, even when made with greatest care, is generally useless for musical purposes. A church bell should be somewhat larger than two feet in diameter to exhibit any good qualities. At this diameter a dividing line occurs which separates gongs and hand-bells from church-bells most completely. This fact furnishes us with an illustration of the circumstance that many of the laws framed respecting bells and other musical instruments hold good only in a certain limited range, and hence it is idle to formulate these laws as if they were capable of universal application. All symmetrical theories should be regarded with suspicion until they are verified at all points. Certain elaborate tables and acoustic formulæ recently published, even if accurate, are of little use, both for the reason just indicated and because of certain factors being left out of the calculations. If it be scarcely possible to alter the first overtone of a tuning-fork without changing the pitch of its fundamental, one can hardly hope to bring the harmonic tones of a bell into complete accord. Bells are, unlike other musical instruments, greatly unlike one another, and are so little amenable to treatment in tuning that they may be said to be a law unto themselves. Measurements that are excellent for a "B flat" or for a "C" bell will fail to produce good results for higher notes. Before "F sharp" is reached, it is necessary to begin to increase gradually the thickness of the thickest part of the soundbow, from $\frac{1}{13}$ of the diameter of the bell to $\frac{1}{11}$, or even up to $\frac{1}{10}$, but not more, and at the same time the soundbow must be placed higher.

It is partly on account of the comparative weakness of the tone of such small bells (and it cannot be greatly strengthened without overloading and clogging the tone) that the union of large and small bells is acoustically bad.

For reasons such as these, an "E flat" chime of 8 bells and a "D flat" chime of 10 bells are recommended as the best in point of key, and not simply because of their key-character. A chime in "E natural" appears thin throughout; and if it consist of 10 bells, and rises to "G sharp" at the top of the treble stave, it extends dangerously near to the extreme limits. The 8 notes of a chime in "E flat" are not only in the best tonal region for effect, but the small bells are better able to hold their own against the large ones; and these last are not so very large, nor so ponderous as regards tone, as to strive for preeminence among themselves, like conflicting basses in organ music.

The diameters of bells are as the reciprocals of the vibrations. If, therefore, it is required to form a peal of 4 bells that shall give the first, third, fifth, and octave of a major scale (the vibrations of which are in the ratio of 4 : 5 : 6 : 8), the diameters of the bells must be in the proportion of $\frac{1}{4}$th, $\frac{1}{5}$th, $\frac{1}{6}$th, and $\frac{1}{8}$th of some chosen standard.

On the Continent of Europe bells are made of greater vertical height than in America, where tall bells are out of favor. The greater beauty of the tone obtained from bells when swung is well known. A 3500-pound bell giving low "D" would have a height of 37⅝ inches, and one of 400 pounds giving high "D" a height of 18¼ inches. Hence the relation of height to diameter is not exactly constant. The thickness of the soundbow is 1/13 of the diameter; that of the waist is ⅓ that of the soundbow; and just below the shoulder the thickness is 1/30 of the diameter. The weight of the clapper is 1/40 that of the bell; and the clapper must be provided with a tail, called the "flight," without which it will not fly in such a way as to deliver the required blow.

The aim of the best American founders is to produce the greatest volume and prolongation of tone, as well as the best quality (timbre) and travelling character, from the least weight of metal. In every quarter of the globe the American bells are found, and they are designed and cast with such uniformity that their characteristics are well defined as regards harmonics. Their weights are easy to remember, being 5000 pounds for middle "C" and 500 pounds for "C" of the treble stave. They are lighter than those by English founders, while these again are lighter than those made on the Continent of Europe. Therefore, although the heights and diameters of bells follow the laws regulating the lengths of organ-pipes, their weights have another progression. A bell cast for the octave above any note, though half the diameter of the lower-toned bell, is not half the weight, but only ⅕ or 1/16, while the standard of weight chosen for bells may be high or low, so that an "E flat" chime, for instance, may be very heavy or very light. It is therefore best to contract for bells by weight, after deciding on the nature of the alloy, and to pay for the several items of mounting in a separate account. Bell metal is gun metal with more tin added, though with less tin than is used for a speculum. The great bell at Darmstadt consists of a mixture of copper, tin, lead, iron, and nickel. Brass has been used very generally in Europe and iron in France. Bells of steel are made in Sheffield and in the United States. They are light and cheap, but are used chiefly for factories, since their tone is not in much favor. In America from 65 to 80 per cent. of Lake Superior copper is employed, and the rest is Malacca block-tin. Gold, silver and lead are excluded as deadening the tone, and zinc as causing a certain shrillness.

In view of the difficulties attending castings of great size, it is high time for manufacturers to take into consideration the subject of atomic weights. Since the atomic weight of copper is 32, and that of tin 59, the composition of bell metal should be in the proportion of six atoms of copper to one of tin, or 13 pounds of copper to 4 of tin. The proportion 3 to 1 gives a result too brittle for large bells; 19 of copper to 5 of tin is too soft, and the tone is wanting in masculinity; but some founders prefer to use more copper because the bells are easier to tune. Tin, however, improves the tone of bells, as well as of organ-pipes; and more tin is wanted in these days because the copper, being worked more closely from the ore by modern methods, is much more brittle than formerly.

It seems barely possible to co-ordinate all the various factors so as to produce a really good mono-polytone bell that will not crack or fail in some important particular. It seems theoretically possible to make the overtones more harmonious, by improving the quality of the metal. For this will improve the general quality (timbre) of bells, which, according to Helmholtz, cannot occur without affecting overtones.

For reasons why bells are heard to a greater distance on plains than on hills, and in valleys farther still, see article ACOUSTICS, vol. i. It must be specially noted, however, that in towns, bells should be mounted at least above the tops of adjacent houses; otherwise, as in the case of St. Mark's Church, Philadelphia, the sounds will be confined within a square, and will be reflected from many angles therein, to the infliction of great torture upon sensitive persons.

From time immemorial bell-ringers have been accustomed to ring changes on bells in rapid succession; taking care not to repeat any given order of succession. A peal of 8 bells will allow 40,320 such orders of succession. There was formerly no attempt at melody; but the bells were rung one at a time, so very rapidly that their low sub-harmonics united their thunderous tones in one confused roar; while the clusters of overtones were partly hidden by the rapid succession of the primaries. All this is now changed. We aspire to be artistic, but it must be confessed that we set to work in a singular fashion. Quick tunes are not now played on bells, but slow ones; and instead of masculine church melodies more sentimental hymns are in favor. Supposing that a large bell speaks "D" and its strongest overtones are "F" and "B flat." If now this bell were the last one sounded in a chime giving the scale "D major," the final chord of "B flat" thus coming suddenly upon the ear and remaining as a last impression unchecked and unresolved, there would result a conjunction of sounds exasperating enough to any person of refined perceptions; but were such a bell to be sounded with the "F sharp," horrible discords would result. Yet we have to endure all this. Moreover, the bells of a chime are rarely in tune among themselves, the fourth note of the scale being almost always too high and the seventh sound too low in pitch. The system of "equal temperament" is especially bad in tuning bells on account of the power of their tones, and the absence of concords, which is due to the want of simple ratios among simple sounds. By tuning bells in equal temperament imperfections will be introduced merely for the sake of performing chromatic music upon them—a use for which they are manifestly unfit. Ideally perfect bell-music does not yet exist; but its production is certainly one of the possibilities of the future. It should be composed by men who, in addition to talents for musical composition, have a sufficient knowledge of the acoustics of bells, and of the necessary limitations in their capabilities. The range of bell-sounds must always be limited. Since the difficulties to be overcome in casting bells lower than the middle of the tonal region are disproportionately great, and since very small bells do not sound well when played with large ones, a compass of more than an octave and a half from middle "C" to "G" above is very exceptional. The ideas to be applied to bell-music must be conceived with special reference to large bells, bearing in mind the unavoidable defects in our system of tuning and the inharmoniousness of the attendant sounds. As the power of many of these tones is developed some time after percussion, and as there is no device for "damping" as in the piano-forte, myriads of these tones form and overlap one another, causing discords of the most unpleasant kind, which are increased when chromatic progressions are used. The Meneely device for chiming, which enables the performer to accentuate notes at will, places a new resource in the hands of the composer.

When there is added to a chime of bells a ninth note, it is better to have a minor seventh than a raised fourth; for the former is much smaller, and therefore cheaper, and requires less accommodation; and it provides not only a second scale but a more convenient one; for the raised fourth (which favors modulation into the dominant) is not so closely related to the other sounds, whereas the flat seventh, especially if very flat, as it ought to be, is very closely related. Besides all this, it favors modulation into the subdominant, which gives the peculiar flavor perceived in cadences in the plagal mode of the church. If there is a tenth bell, it ought to be the octave of the second sound of the scale.

With a chime like that we have just described the following passage, in which 7 does not apply to the flat seventh, would be very effective as regards harmonic considerations: 2, 6, 4, 2, 7, 9, 7, 5, 3, 5, 3, 1, 6, 8, 6, 4, 2, 6, 4, 2, 7, 9, 7, 5, 3, 5, 3, 1, 8, 3, 5, 1. If now these, or similar fundamental forms, are varied rhythmically or enlivened by short evanescent notes that are soft or insignificant from occurring on a subdivision of a weak or unaccentuated portion of a musical foot or measure, melodies will be formed in which the harmony is not implied, as in a simple Verdi tune, but in which it will be actually contained. (S. A. P.)

BELL, ISAAC LOWTHIAN, F. R. S., an English iron-manufacturer, was born at Newcastle-on-Tyne in 1816. He was educated partly in Germany and Denmark, then studied physical science at the University of Edinburgh and the Sorbonne at Paris. Afterwards entering the chemical and iron-works at Walker under the direction of his father and others, he acquired a thorough knowledge of the iron manufacture. On the death of his father in 1845 he became managing partner of the Walker Iron-Works, being at the same time associated with his brothers in another enterprise. In 1850 he gave up his connection with the former, and founded the chemical works at Washington-on-Tyne for manufacturing soda and oxychloride of lead, a pigment discovered by his father-in-law, Mr. H. L. Pattinson. The firm of Bell Brothers in 1852 founded the Clarence Iron-Works on the Tees, in consequence of the discovery of iron ore in the vicinity. These works have since been extended to embrace twelve blast-furnaces, and connected with them there are extensive iron-mines, limestone-quarries, and collieries. Mr. Bell was one of the founders of the Iron and Steel Institute, and has frequently contributed to its *Proceedings* on matters connected with metallurgy. He has been twice mayor of Newcastle-on-Tyne, having also filled the offices of alderman and of sheriff of that town. He was a Liberal candidate for Parliament from North Durham in 1868, but was defeated; in 1874 he was elected, but after a time was unseated. He was then in 1875 returned for Hartlepool, but lost his seat in 1880.

BELL, JOHN (1797–1869), an American statesman, was born near Nashville, Tenn., Feb. 18, 1797. He was educated at Cumberland College, studied law, and was admitted to the bar in 1816. The next year he was elected to the State senate when only twenty years of age, but declined a re-election, and devoted himself to his profession. In 1826 he became a candidate for Congress against Felix Grundy, who was highly popular and had the support of General Jackson, then a candidate for the Presidency. In 1827, Bell was elected, and remained in Congress till 1841, acquiring great distinction as a debater. Though originally in favor of free trade, he changed his views and became an earnest advocate of a protective tariff and of the improvement of rivers and harbors by the national Government. He opposed Calhoun's schemes of nullification, and supported General Jackson as candidate for the Presidency in 1832. He was in favor of a United States bank, but for special reasons voted against the renewal of its charter. He protested against President Jackson's removal of the deposits from the United States Bank, and was led in consequence to sever his connection with the Democratic party. In 1834 the Whigs elected him Speaker of the House of Representatives in opposition to James K. Polk. In 1836 he advocated the election of Hugh L. White to the Presidency in opposition to Mr. Van Buren, and helped to carry the State of Tennessee against the Democratic party. When the question of receiving petitions for the abolition of slavery in the District of Columbia arose in the House of Representatives, Mr. Bell favored their reception, and, though strongly assailed for his course, was re-elected, and in 1838 voted against the "gag" resolutions of Mr. Atherton which required such petitions to be received without debate. In 1841 he was made Secretary of War by President Harrison, but resigned in September in consequence of Mr. Tyler's separation from the Whig party. He then declined an election to the United States Senate, and retired to private life. In 1847 he was elected to the Senate, and actively opposed the Texas annexation policy and favored Mr. Clay's compromise of 1850. In 1853 he was re-elected, and opposed the repeal of the Missouri Compromise and the admission of Kansas under the Lecompton constitution. In 1860, when secession was threatened by the Southern States, a convention of the "Constitutional Union" party nominated Mr. Bell for President and Edward Everett for Vice-President. They received the electoral votes of Tennessee, Virginia, and Kentucky, and a large popular vote in several Southern States. Mr. Bell then retired from public life, and during the civil war took no prominent part. He died at Cumberland Iron-Works, Tenn., Sept. 10, 1869.

BELL, JOHN, an English sculptor, was born in Norfolk in 1811. After preparing for college he entered the schools of the Royal Academy, and began the study of painting, but soon turned his attention to sculpture. In 1832 he made his first exhibition, Girl at a Brook, and his next was Psyche feeding a Swan. The sculpture which established his reputation was the Eagle-slayer, a bronze figure, first exhibited in 1844. In the same year he was commissioned to execute statues of Lord Falkland and Sir Robert Walpole for the Houses of Parliament, and he has since made statues of Shakespeare, Newton, Cromwell, and other distinguished Englishmen. In the memorial of the duke of Wellington, erected by him in Guildhall, London, the duke is represented between statues of Peace and War. In the Guards' Memorial, Waterloo Place, London, Mr. Bell is responsible only for the statues of the three guardsmen, the crowning figure having been added by others. Besides these and other historical and memorial works, he has produced a large number of religious, allegorical, and poetic statues and groups. Among his female figures are Una and the Lion, The Maid of Saragossa, Imogen entering the Cave, Andromeda bound to the Rock. The last, a bronze of life-size, with an elaborately decorated bronze pedestal, was exhibited at the London Crystal Palace in 1851, and was purchased by the queen. In 1872, in connection with the Prince Albert Memorial in Hyde Park, Mr. Bell produced a work which has proved very attractive to Americans. A copy in terra cotta stood in the centre of the Fine Arts Hall at the Centennial Exhibition in Philadelphia, and is now in Washington. It is of colossal size, and represents the United States directing the Progress of America. A female figure, seated on a buffalo charging through the prairie grass, typifies the New World; she bears on her left arm a shield with various emblems; in her right hand is a feathered lance. In front a female, with a star in her hair and over her shoulders a baldric studded with stars, wields a sceptre and directs the onward course of the buffalo. On the other side is Canada, habited in furs and pressing the rose of England to her bosom, though she turns her face towards the United States. In the rear are two male figures seated, denoting the less progressive Mexico and South America. The confidence in her destiny manifested in the noble countenance of the central figure, the untamed energy of the buffalo, the conscious supremacy in the look and gesture of the figure with the sceptre, and the sense of power and progress which radiates from the whole work, attest the greatness of the sculptor. Bronze statuettes of the group have been made for the Art Union of London. In later years Mr. Bell has been chiefly engaged on poetic and epic subjects and reproductions in marble of his earlier works. Though he has frequently visited Italy, he has always resided in England, chiefly in the suburbs of London. He has endeavored to make his sculpture worthy of study, not only from intrinsic grandeur or beauty, but from the ideas embodied. He also had the good fortune by furnishing certain designs for carved wooden platters and knives to establish a trade which has furnished employment to many women and children. In 1859 he proposed before the Society of Arts to apply to the obelisk the principle of entasis which the Greeks had given to the column. Besides his treatise on *The Obelisk*, he has discussed *The*

Coloring of Statues and the *Primary Sensations of the Mind.* He has also prepared a *Free-hand Drawing-book for the Use of Artisans,* and has even ventured into the dramatic field in his *Ivan, or a Day and a Night in Russia.*

BELLAIRE, a city in the eastern part of Belmont co., Ohio, is on the Ohio River, 5 miles below Wheeling. Here the Baltimore and Ohio Railroad crosses the river on a magnificent iron bridge; the Cleveland, Pittsburg, and Wheeling Railroad and the Bellaire, Zanesville, and Cincinnati Railroad terminate here. Bellaire has a national bank, a private bank, ten churches, good schools, gas- and water-works, a street railroad, and two daily and three weekly newspapers. The surrounding country is a rich agricultural district, and also abounds in coal, iron, limestone, and fire-clay. It has a blast-furnace, nail-mill, two foundries, two machine-shops besides those connected with the railroads and factories, three window-glass factories, five flint-glass factories, bottle-works, tinware-factory, two lantern-factories, three grist-mills, and eight coal-works. Population, 8025.

BELLAMY, Joseph, D.D. (1719–1790), a Congregational minister, was born at New Cheshire, Conn., in 1719. He graduated at Yale College in 1735, and soon after began to study for the ministry. In 1737 he was licensed to preach, and notwithstanding his youth gained a high reputation. In 1740 he was ordained pastor of a church at Bethlehem, Conn., and devoted himself to theological study as well as pastoral work. Two years later, being aroused to the religious needs of other places, he spent much time in preaching-tours in Connecticut and neighboring colonies. His early expectations of the results of the "Great Revival" were not realized, and he became alarmed at the intrusion of ignorant men into the place of public teachers. He therefore gave up his itinerant labors and retired to compose his principal work, *True Religion Delineated* (Boston, 1750), which was soon reprinted in Scotland. On account of his eminence as an orthodox Calvinistic theologian many candidates for the ministry repaired to him for instruction. He devoted much time to their systematic training, first directing them to such writers as he approved, and afterwards, when they were well grounded, requiring them to read and refute the ablest opponents of his system. Many eminent ministers of New England were thus trained, and ever after regarded him with affectionate veneration, while generally he was considered severe and domineering. He received the degree of doctor of divinity from Aberdeen University in 1768. He died at Bethlehem, March 6, 1790. Besides several sermons, he published *Theron, Paulinus, and Aspasio*, a series of letters and dialogues on religious subjects, and some pamphlets attacking the Half-way Covenant. His collected works were published at New York in 1811, and again at Boston in 1853.

BELLEFONTAINE, the county-seat of Logan co., Ohio, is at the crossing of the Cleveland and Indianapolis and the Cincinnati and Sandusky Railroads, 113 miles N. E. of Cincinnati, and is also on the Cleveland, Columbus, Cincinnati, and Indianapolis Railroad. It is lighted with gas, has a paid fire department, a stone court-house, a fine brick school-house, three large hotels, a national bank, a private bank, three weekly newspapers, and a public library. It has the highest elevation of any town in Ohio, and is noted for its healthfulness and beauty. It has large woollen-mills, flour-mills, foundry, machine-shops, chair-factory, three carriage-factories, etc. It was laid out in 1818. Population, 3998.

BELLEFONTE, the county-seat of Centre co., Pa., is on Spring Creek, at the foot of Bald Eagle Mountain, 150 miles W. of Harrisburg and 47 miles N. E. of Altoona. It has two railroads—the Bald Eagle Valley, a branch of the Pennsylvania Central, and the Bellefonte and Snow Shoe. There is a fine iron bridge over Spring Creek. The borough is lighted with gas, and has good county buildings, four hotels, a national bank and two other banks, one daily and three weekly newspapers, eight churches, a public library, eleven public schools, and the Bellefonte Academy. The chief industrial establishments are railroad car-shops, nail-works, foundry and machine-shop, glass-factory, planing-mill, and two flour-mills. Bellefonte derives its name from a large spring, which, with the aid of water-works, supplies the borough. It was settled in 1778 and incorporated in 1800. Its property is valued at $850,000, and its public debt is $120,000. Population, 3026.

BELLE PLAINE, an incorporated town of Benton co., Iowa, is on the Chicago and North-western Railroad, 116 miles W. of the Mississippi River and two miles N. of the Iowa River. Being a division terminus of the railroad, it has a round-house and car-repair shops. It has a national bank, three hotels, a weekly newspaper, four churches, two public school-houses, two steam grain-elevators, grain warehouse, two flour-mills, a foundry, a glove-factory, and a creamery. It was laid out in 1862 and incorporated in 1868. Population. 1689.

BELLEVILLE, the county-seat of St. Clair co., Ill., is on the Southern Illinois division of the St. Louis, Alton, and Terre Haute Railroad, Louisville and Nashville Railroad, Illinois and St. Louis Railroad, and the Belleville and Carondelet Railroad, 14 miles S. E. of St. Louis. It is well lighted with gas, has a national bank, a savings bank, five hotels, two daily and two weekly German newspapers and two weekly English newspapers, eight churches, a convent, good schools, and a public library. Its industrial establishments comprise a large rolling-mill, three drill-factories, machine-works, nail-mill, oil-mill, carriage-factories, tile-works, glass-works, sewing-machine works, four flour-mills, and several breweries. Population, 10,683. The surrounding country abounds in bituminous coal, in mining which 1300 men are employed.

BELLEVILLE, a port of entry and the county-seat of Hastings co., Ont., on the Bay of Quinte in Lake Ontario, at the mouth of the river Moira, and on the Grand Trunk Railway, 43 miles W. of Kingston. It is well built and lighted with gas; it has a fine custom-house and other public buildings, two banks, nine churches, a deaf and dumb asylum, and is the seat of Albert University, under the control of the Methodist Episcopal Church. The harbor is good, and the river furnishes abundant water for the industrial works, which comprise four foundries, two woollen-mills, and manufactures of locomotives, sewing-machines, pottery, sash and blinds, flour, furniture, etc. Two daily and three weekly newspapers are published here. Steamboats ply between this port and Montreal and Kingston. Population, 9516.

BELLEVUE, a village lying in both Huron and Sandusky cos., Ohio, is 15 miles S. of Lake Erie, on the Lake Shore and Michigan Southern Railroad, the Wheeling and Lake Erie Railroad, and the New York, Chicago, and St. Louis Railroad. The last has here a large round-house, machine-shops, and car-shops. The town has two banks, seven churches, two weekly newspapers, foundries, two flour-mills, and manufactures of barrels, carriages, ploughs, and furniture. It was originally an Indian trading-post, and was incorporated as a village in 1841. Population, 2169.

BELLINGHAM, Richard (1592–1672), colonial governor of Massachusetts, was a lawyer and one of the original patentees of that colony. He came to America in 1634, and the following year was made lieutenant-governor. In 1641 he was elected governor in opposition to Winthrop. He held these positions several times, having been governor for ten years and lieutenant-governor for thirteen. In 1664 he was chosen major-general. In 1641 he married a second wife, performing the ceremony himself. He was prosecuted for violation of the law in not having the banns properly published, but he refused to leave the bench, and was thus acquitted. He died Dec. 7, 1672. By his will he left his estate, after the death of his son and granddaughter, for the maintenance "of godly ministers and preachers," but this was set aside by the court on the ground that it interfered with the rights of the family. His sister, Mrs. Anne Hibbins, was executed at Salem during the witchcraft delusion.

BELLOWS, Henry Whitney (1814–1882), was born in Boston, June 11, 1814. He graduated at Harvard in 1832, and from the Divinity School in 1837. He received the degree of D. D. in 1854, and was settled in New York in 1839. He gave the Phi Beta Kappa oration at Harvard in 1853. His address upon the drama was made in 1857; in 1857 he also gave a course of Lowell lectures in Boston upon the treatment of social diseases.

He first visited Europe during the summer of 1848, a second time (a fifteen months' journey) in 1867 and 1868, and a third time during the summer of 1872. His visit to California was in April, 1864. He died Jan. 30, 1882.

He was a twin brother with one long since dead. Even as a child he showed, besides the common sensitiveness, a singular and almost premature sensibility. But a distinguished professor of philosophy at Harvard made the prediction, well fulfilled, that he would become one of the ablest men in the nation. His first preaching, with his earnest manner and melodious voice, presignified the persuasive power that practice and experience would unfold. After drawing special attention in a brief service as a clergyman at the South, he became for the last twenty years of his life a sort of metropolitan bishop of the Unitarian fold of Christians. But perhaps his most memorable work was as president of the Sanitary Commission, whose inauguration he promoted, and to whose administration with zealous associates, among whom Frederick Law Olmsted was conspicuous, he was devoted day and night through the prolonged peril into which secession brought this whole Western continent. From his last absence abroad he brought home material for some volumes of travels and reflections yet in print. He was editor for years of the *Liberal Christian* in New York. His principal literary work is a book of discourses entitled *Restatements of Christian Doctrine*. Further publication of his life, letters, and sermons is proposed.

But he was more an actor on the stage of affairs than a studious or musing man. His talent and his tendency were executive. When the Unitarian pulpit in San Francisco was left vacant by the decease of Thomas Starr King, who did much to save California to the Union, Dr. Bellows rushed to the rescue. His faculty was not to invent in the realm of ideas, but to organize and mould. Rest to him was torment. He would have become insane if held in long repose, as the strait-jacket sometimes causes the madness it is meant to cure or restrain. Up and doing he must be, and he ingenuously declared he came into the world under a devouring love of his fellow-men; and with a necessity to serve them, he might also have truly averred. His life was all morning, and no afternoon, in journeyings as frequent as the apostle Paul's, whom indeed he resembled in more than one characteristic. He was not content that needy persons and good objects should seek him: like Job, the cause he knew not he searched out, whether it was an embryo institution of learning, a college pining for lack of funds, a religious denomination striving to extend its borders, a missionary post struggling with scanty means against the mingled host of ignorance and sin, an educational project in Ohio, a forlorn band of fellow-disciples in Transylvania, the great city of his adoption in the grasp of official corruption, a vacant pulpit like a deserted diocese in California, a divinity school in Cambridge or Meadville requiring support for old or new professorships, his country in the grip of civil war, a hospital ill-supplied with food, physicians, nurses, or medicine, or the humblest individual in distress. Whatever the crisis, humanitarian or patriotic, he must be on the spot. His sympathy went like fire to any troop he heard on the march for mercy or righteousness. He valued his kindred blood only less than that of which God hath made all nations. He charged his own sect to stick to their regimental colors, yet no one order of believers was so dear to him or deep in his heart as the universal Church and entire Christendom. He thought he took very definite views of the conservative sort, yet he communed with the radicals and would have found it hard to state his creed. He was rather "under conviction" than had convictions that any articles could have expressed or contained.

He had in him less of the Saxon than of the Celt. He showed the solidarity of which the French Leroux wrote so well more than the English independence. He was so much stronger in others than in himself that in a lonely or isolated condition he would scarce have risen far above an average force. Faculty rather than genius was his stamp.

Dr. Bellows, be the reasons what they may, has a large place of love and honor in the bosom of these United States. His weight for union and freedom was a sensible addition to our resources, and there would have been a fearful subtraction in its loss. He was clerical; he delighted in his ecclesiastical business, rejoiced in all its offices, even in its hereditary black gown; yet he was confined to no single parish or pulpit. He stood as a leader among his peers, as a protester against the modern materialism that opens its mouth to swallow all, and as a witness for Christ and God and heaven. (C. A. B.)

BELLOWS FALLS, a village of Windham co., Vt., is on the W. bank of the Connecticut River, on the Central Vermont Railroad, 53 miles S. E. of Rutland, and is the junction of four railroads—the Rutland, Sullivan, Cheshire, and Vermont Valley. The river has a fall of 50 feet near this place, furnishing abundant water-power, which is used especially in the manufacture of paper. There are also machine-shops, farm-machine works, iron-foundry, scythe-works, sash-and-blind factory, and chair-factory. The town has a national bank, two hotels, a weekly newspaper, six churches, seven public schools, and St. Agnes Hall, an academy for girls. It has a medicinal spring, and was formerly a resort for the Indians. Population, 2229.

BELMONT, a post-village and steamboat-landing of Mississippi co., Mo., on the right bank of the Mississippi River, opposite Columbus, Ky., is the terminus of a division of the St. Louis, Iron Mountain, and Southern Railroad, 195 miles by rail south of St. Louis. It was the scene of one of the early actions during the Civil War. Gen. Grant, who was in command at Cairo, having directed Gen. C. F. Smith to make a demonstration on Columbus from Paducah, embarked an expeditionary force at Cairo on the 6th of Nov., 1861. It consisted of 3114 men, chiefly Illinois volunteers, with the Seventh Iowa, and was conveyed by four boats under convoy of the gunboats Lexington and Tyler. In the evening they reached Island No. 1, 11 miles above Columbus, where Grant heard that Bishop Polk, the Confederate general, informed of his design, was sending troops across to Belmont. Next morning Grant moved to Hunter's Point, 2 miles above Belmont, where he landed his force and pushed forward. He found Polk, with Pillow and Tappan, waiting for him, and his skirmishers drove them back to their entrenched camp, which was protected by an abatis. The Federal troops charged through the abatis and over the works, and drove the enemy to their boats. As the site was low ground and exposed to the fire of heavy guns from Columbus, Grant set fire to everything, and was about to fall back when a large reinforcement of Confederate infantry crossed the river from Columbus. There was nothing left but to fall back: his own command was somewhat disorganized by breaking ranks to plunder, and they suffered much in a disorderly retreat. They succeeded, however, in gaining their boats, and set out at five in the afternoon for Cairo. The Federal losses were 487 killed, wounded, and missing; the Confederates lost 632. This was an indecisive action, the first in which Grant had commanded, but it kept the enemy from sending a force into Missouri to cut off the Federal detachments, and it prevented Thompson from reinforcing Price. (H. C.)

BELOIT, the county seat of Mitchell co., Kan., is on the Solomon River, 165 miles N. W. of Topeka, on the Kansas branch of the Missouri Pacific Railroad. It has seven hotels, four banks (one national), one daily and three weekly newspapers, a public library, seven churches, four schools, and a college. It has two foundries, two factories, and flour-mills. It has a park and water-works. It was settled in 1866 and incorporated in 1869. Its property is valued at $950,000; its public debt is $1400, and its yearly expenses are $14.000. Population, chiefly of American birth. 1835.

BELOIT, an incorporated city of Rock co., Wis., is on Rock River, just N. of the Illinois line, and 92 miles W. N. W. of Chicago. It is at the intersection of the Chicago and North-western Railroad with the Racine and South-western division of the Chicago, Milwaukee, and St. Paul Railroad. It has four hotels, three national banks, a savings bank, two daily and two weekly newspapers, an opera-house, nine churches, a high school, and three ward schools. Several of the churches and schools have very fine buildings. Beloit College has six buildings, including an observatory, and a beautiful campus of twenty acres in which are several ancient mounds. The industries of the city comprise three paper-mills, four flour-mills, a windmill-factory, iron-works, machine-shops, manufactures of ploughs, wagons, shoes, water-wheels, knives, scales, paint, gloves, paper, pails, and machinery for flour-mills and paper-mills. It is a handsome city, on a moderate elevation above the river, with well-shaded streets, a park, gas, telephone, exchange, and water-works. Its property is valued at more than $3,000,000; its public debt is $99,000, and its public expenses $7085. It was settled in 1836, and incorporated in 1856. It has excellent water-power and is a prosperous manufacturing town. Population, chiefly of New England origin, 4790.

BELTON, the county-seat of Bell co., Texas, is 60 miles N. N. E. of Austin, on the S. bank of the Leon River, crossed here by a fine iron bridge, and on the Gulf, Colorado, and Santa Fé Railroad and the western branch of the Missouri Pacific Railroad. It has three hotels, a fine opera-house, two banks, three weekly newspapers, ten churches, good schools, and an extensive trade. It is well supplied with water and building-stone, and is surrounded by a fertile country. Population, 1797.

BELVIDERE, the county-seat of Boone co., Ill., is an incorporated city on the Kishwaukee River, 78 miles W. of Chicago, and on the Chicago and North-western Railroad. It has a fine court-house, two public halls, two banks (one national), three hotels, three weekly newspapers, six churches, and two graded schools. The river affords water-power for numerous mills, and there are also manufactories of cheese, ploughs, reapers, and boots and shoes. Population, 2951.

BENDEMANN, EDUARD, a German artist, was born at Berlin, Dec. 3, 1811. He studied at the Düsseldorf Academy under Schadow, whose daughter he married. In 1832, on his return from a visit to Italy, he exhibited his picture entitled By the Waters of Babylon. This work, which is now in the museum of Cologne, has frequently been engraved, and upon it Bendemann's fame chiefly rests outside of Germany. The artist, however, is the author of a number of important works, and he is very highly esteemed in his own country. Among his best-known pictures is Jeremiah among the Ruins of Jerusalem, which took a medal at Paris in 1837, and which is now in the national gallery at Berlin. In addition to his easel-pictures, Bendemann has executed many important decorations, notably the frescoes at the royal castle at Dresden. His portraits are greatly admired. Bendemann succeeded Schadow in 1860 as the director of the Düsseldorf Academy. In 1866 he painted the frieze of the Realschule at Düsseldorf, which contains, besides allegories, the portraits of the most illustrious Germans. In 1867 he resigned his position at the Düsseldorf Academy, and he has since been employed on many important works, among which are the Leading of the Jews into the Babylonish Captivity (1872), for the National Gallery at Berlin; Penelope (1877), for the Antwerp Academy; and three large allegorical paintings called The Journey through the Wilderness. He has received numerous medals and decorations.

BENEDEK, LUDWIG VON (1804–1881), an Austrian general, born at Œdenburg, Hungary, July 14, 1804, the son of a physician. He early displayed a taste for the military profession. After studying at the academy at Neustadt, he entered the army as a cornet in 1822. Passing through the intervening grades, he became a colonel in 1843. He was distinguished during the insurrection in Galicia in 1845 for his promptitude in action, and was sent to pacify the western part of that province, which he succeeded in doing. For this he received the insignia of the order of Leopold. In 1847 he was sent to Italy, where he was distinguished by his judicious and cool retreat from Milan to Osona, and also for his part in the battle of Curtatone. He was rewarded by Radetsky with the order of Maria Theresa. In 1849 he participated in the siege of Mortara and the battle of Novara, and was appointed as major-general to command the first reserve corps of the Army of the Danube. During the campaign in Hungary he was severely wounded by a bombshell. At the close of the war he was sent as chief of staff to the second corps of the Army of Italy. In 1859 he took a distinguished part in the war waged by Austria against France and Sardinia, and covered the retreat from Milan to the Mincio. At the battle of Solferino he commanded the Austrian right wing, which gained some temporary advantage over the French left. After that action he relieved Marshal de Hess in the supreme command, and when peace was suddenly and unexpectedly concluded he remained in Venetia at the head of the Austrian forces, and displayed great tact in harmonizing the different nationalities of which they were composed. When Prussia and Austria went to war in 1866 he was placed in command of the Army of the North, and, as he fell back successively, it appeared as if he was luring the Prussians on to their destruction. Great results were expected from this policy, which were not realized. He permitted them to unite their armies in Bohemia and to deliver the very severe battle of Königgrätz, more commonly known as that of Sadowa, in which, on the 3d of July, 1866, the Austrians were entirely defeated and the war effectually terminated. The battle lasted from six o'clock in the morning until two in the afternoon, and it was claimed that the Prussian success was chiefly due to the superiority of the needle-gun to the ordinary musket used by the Austrians. A storm of indignation burst upon Benedek; he was deprived of the command and removed from the active list. He died at Gratz, April 27, 1881. (H. C.)

BENEDICT, SIR JULIUS, the musical composer, was born at Stuttgart, Nov. 27, 1804. In boyhood, while studying under Hummel at Weimar, his abilities attracted great attention. Weber then offered him a home and instruction. At nineteen years of age Benedict conducted some operatic performances at Vienna. After producing the opera *Giacinta ed Ernesto* at San Carlo, Naples, he began a second, *Portoghesi in Goa*, which was given for the first time at Stuttgart in 1830. Five years later he visited Paris, passing on to London, where he has resided ever since. Before visiting America with Jenny Lind in 1850, he had produced three operas in that city—viz. *The Gypsy's Warning*, *The Brides of Venice*, and *The Crusaders*. Benedict repaid Weber's kindnesses by preparing the celebrated opera *Oberon* for production in Italian in London, adding recitative with instrumental accompaniments, in which were found reminiscences of favorite melodies that occur in the overture and elsewhere in the most intelligent manner, thoroughly in sympathy and keeping with his honored master's work.

In the same year (1860) Benedict wrote the cantata *Undine* for the Norwich Festival; in 1862, *The Lily of Killarney* (as an operatic setting of *The Colleen Bawn*); in 1863, the cantata *Cœur de Lion;* in 1864, the opera *Bride of Song;* and in 1870, the oratorio *St. Peter*.

The following year Benedict received the honor of knighthood, and on his seventieth birthday was made knight commander of the orders of Francis and Joseph (Austria) and Frederic (Wurtemberg). Benedict also received decorations from the sovereigns of Prussia, Sweden, Italy, Portugal, Hanover, and Belgium. He lives a life of ceaseless toil and exhibits almost superhuman energy—conducting the Monday Popular Concerts and various festivals, giving many music-lessons, editing and composing for music-publishers, playing accompaniments in public assemblies and social gatherings, and in projecting works of considerable length and magnitude.

Although his oratorio *St. Peter* is disfigured by many recurrences of the form of elaboration known as *rosalia*, and when compared with the works of the best masters is seen to be contrapuntally weak, his secular productions are entitled to much higher artistic rank, for they do not fall below the requirements of the styles of writing accepted as satisfactory for such works. Benedict's productions have distinguishing peculiarities, such as melodies that do not skip, carefully-conducted harmonies, and symmetrically-planned forms; and, although not of equal value, they are the work of a musician thoroughly respected by artists. (S. A. P.)

BENEDICTINES, ORDER OF (in the United States).

See Vol. III. p. 481 Am. ed. (p. 558 Edin. ed.).

The first historical notice of the Benedictines in America is contained in the appointment of one Bernardo Buil, a Benedictine, to be vicar-general of the newly-discovered world. He accompanied Columbus on his second voyage of discovery. But as the main purpose of tho order of St. Benedict is the union of a life of study with religious seclusion, no extended missionary efforts were made by them, the field being relinquished to the Franciscans and the Jesuits. Indeed, the first formal settlement of the Benedictines in the United States dates only from the year 1846. The bishop of Pittsburg, Rt. Rev. M. O'Connor, whilst on a visit to Bavaria induced a number of Benedictines to found a house at Latrobe, Pa. Under the direction of the Rev. Boniface Wimmer sixteen brothers and four students in divinity arrived that year in Pennsylvania. The order has been highly successful. It numbers at present (1882) 51 monasteries and 6 priories, and has 2 mitred abbots and a membership of 150 monks. The Holy See, by a brief dated July 29, 1855, raised the monastery of St. Vincent at Latrobe to the dignity of abbey, with Father Wimmer as mitred abbot. He has under his jurisdiction the monasteries of Carrolltown and Indiana in the diocese of Pittsburg, and that of St. Mary's in the diocese of Erie. There is also at St. Meinrad's, Ind., a Benedictine abbey, a filiation of the great abbey of Einsedeln, Switzerland. This American abbey was founded in 1853. The Benedictines are not governed by a general superior, but are divided into congregations. The order in America forms the American Casinensian congregation. Connected with the abbey of St. Vincent there is a flourishing college in which the sacred and secular sciences are taught.

Benedictine Nuns.—In 1853 the first American convent of Benedictine nuns was established at St. Mary's, Pa. They have at present 12 convents, most of which are in the Western States. Tho nuns devote themselves to education.

BENEFIT OF CLERGY, in early English law, a

See Vol. V. p. 723 Am. ed. (p. 827 Edin. ed.).

right enjoyed by the clergy of exemption from the punishment of death imposed by the law for the commission of certain crimes: in later times, a mitigation of the punishment of death imposed by the law for certain crimes which was granted to all culprits who demanded it. Tho claim of the clergy to be exempt from the punishments imposed by civil tribunals was partly recognized by the early English law. When, accordingly, a person in orders had committed petit treason or any of the capital felonies, it was held that on conviction he must be handed over to the ecclesiastical courts, and that the death-penalty provided by law could not be enforced against him. This right of exemption, however, was never admitted to extend to cases of high treason or to petit larceny or to mere misdemeanors; and even among the capital felonies some few were adjudged not clergyable. Among these the principal were arson, highway robbery, and the devastating of cultivated land.

The benefit of clergy was originally confined exclusively to persons in orders, the test in every case as to whether a culprit was entitled to that benefit being whether or not he bore the clerical garb and tonsure. By degrees, however, another criterion came to be applied. Since learning was almost exclusively confined to the clergy, the culprit was presented with a book and asked to read. If he were able to do so, it was presumed that he belonged to the privileged class, and the benefit of clergy was accordingly allowed him. In process of time, as learning grew, many laymen were thus enabled to escape with impunity the consequences of their crimes; and accordingly, by stat. 4 Hen. VII. c. 13, it was provided that no layman should be entitled to the benefit of clergy save upon a first offence. By stat. 1 Edw. VI. c. 12 the benefit of clergy was extended to all peers of the realm, whether they could read or not; and by virtue of stat. 21 Jac. I. c. 6, 3 and 4 Wm. & Mary, c. 9, and 4 and 5 Wm. & Mary, c. 24, the privilege was extended to women in all cases where men had previously been entitled to claim it. By stat. 5 Ann. c. 6 the test whether the culprit was able to read or not was finally abolished, and all persons otherwise entitled to benefit of clergy were enabled to take advantage thereof. By stat. 4 Hen. VII. c. 13 it was provided that all laymen claiming the benefit of clergy should before their discharge be branded with a red-hot iron upon the brawn of the left thumb, so that they should bear an ineffaceable mark which would effectually bar them from setting up their privilege in case of a second offence. This barbarous custom was retained until comparatively recent times. By stat. 10 and 11 Wm. III. c. 23 branding on the left cheek near the nose was substituted, but this provision was repealed by stat. 5 Ann. c. 6. At length, by stat. 19 Geo. III. c. 74 the judge before whom the culprit was tried was enabled to substitute a fine or whipping, or both, in lieu of the branding, at his discretion.

As has been said, the original course of practice was to hand over all culprits claiming their benefit of clergy to the ecclesiastical tribunals, there to be tried for their offence. Both clerical and lay offenders were treated in this manner. The trial in the ecclesiastical court, however, was in the vast majority of cases a solemn farce. Tho accused had only to swear his own innocence and to produce twelve compurgators on his behalf, to be discharged as of course. The jurisdiction of tho ecclesiastical courts in these cases was accordingly, by stat. 18 Eliz. c. 7, abolished, and the judge before whom the prisoner was tried was empowered to imprison him for one year or less, at his discretion. By stats. 4 Geo. I. c. 11, 6 Geo. I. c. 23, 16 Geo. II. c. 15, 8 Geo. III. c. 15, and 19 Geo. III. c. 24, the powers of the judges in such cases were still further extended, and they were enabled to impose tho penalty of transportation or to commit the culprit to prison for various lengths of time proportioned to the enormity of his offence.

The extensive immunity from capital punishment occasioned by the right to claim benefit of clergy induced Parliament from time to time, beginning in the reign of King Henry VIII., to make provisions against the right to claim that benefit in many instances where the penalty of death was by statute affixed to some new class of crimes. By stat. 7 and 8 Geo. IV. c. 28, sect. 26, benefit of clergy has been abolished in Great Britain and also in Ireland.

In the United States the right to claim benefit of clergy has been recognized as part of our common law. By the act of Congress of April 30, 1790, § 3, it is, however, provided that the benefit of clergy shall not be used or allowed upon conviction of any crime for which, by any statute of the United States, the punishment is or shall be declared to be death. Similar statutes have been passed in almost all the States. In some few the doctrine of the right of benefit of clergy is denied ever to have been transplanted into this country.

BENEZET, Anthony (1713–1784), a Philadelphia philanthropist, was born at St. Quentin, France, Jan. 13, 1713. On account of the persecution at that time, his parents, who were Huguenots, removed to London in Feb., 1715. They afterward became Quakers, and emigrated to Philadelphia in 1731. Anthony had been apprenticed to a merchant, but finding that business excited in him too worldly a spirit, he left it to become a cooper. In 1742, after his marriage, he became a teacher in the Friends' English school, and continued to teach till his death. He was constantly engaged in works of benevolence, and was beloved by the poor, and especially by the negroes, to whose welfare he devoted much of his life. In 1762 he published *An Account of that Part of Africa Inhabited by Negroes*; in 1767, *A Caution to Great Britain and her Colonies, in a Short Representation of the Calamitous State of the Enslaved Negroes in the British Dominions*; in 1771, *Some Historical Account of Guinea, with an Inquiry into the Rise and Progress of the Slave-Trade.* During the occupation of Philadelphia by the British army in 1777–78 he was diligent in relieving the sufferings of the prisoners. When peace was proclaimed in 1783, fearing that the revival of commerce would bring a renewal of the slave-trade, he wrote a letter to the queen of England, entreating her to use her influence in the cause of humanity. He also corresponded with all persons in Europe and America that he thought would be likely to aid him in his various benevolent designs. Besides his writings on the slave-trade, he published several religious tracts advocating the principles of the Society of Friends, and *Observations on the Indian Natives of this Continent* (1784). Two years before his death he resigned the charge of the school with which he had long been connected, and devoted himself to the instruction of colored children. He died in Philadelphia, May 3, 1784. A *Memoir of A. Benezet* was published by Roberts Vaux (New York, 1817).

BENFEY, Theodor (1809–1881), a German Orientalist, was born at Nörten, near Göttingen, Jan. 28, 1809. His education was chiefly gained in the University of Göttingen, where he remained until 1827 under the philologists Ottfried Müller, Tychsen, and Dissen. He then studied at Munich, Frankfort, and Heidelberg, returning to Göttingen in 1834. There he received an appointment in 1848 as extraordinary professor of Sanskrit and of comparative philology, and in 1862 became ordinary professor. His first important work was *Ueber die Monatsnamen einiger alter Völker* (1836). This was followed by a German translation of the comedies of Terence (1837) and his *Griechisches Wurzellexikon* (1839–42), for which he received the Volney prize from the Berlin Academy. His *Verhaltniss der ägyptischen Sprache zum semitischen Sprachstamm* (1844) followed. Among his works on Oriental subjects are —*Die persischen Keilinschriften* (1847), with a German translation and a glossary; *Die Hymnen der Samaveda*, with a translation and notes (1848); *Beiträge zur Erklärung des Zend* (1853); a Sanskrit *Chrestomathy* (2 vols., 1853–54); a translation of the *Panchatantra* (2 vols., 1859); *Orient und Occident* (2 vols., 1863–64). His *Sanskrit Grammar* was first issued in 1852, and an abridgment of the same, published in 1855, has been translated into English. Among his other works are—*On Plato's Cratylus* (1866), *History of Oriental Philology in Germany* (1869), and a *Sanskrit-English Dictionary* (1866). He died at Göttingen, June 26, 1881.

BENICIA, an incorporated city in Solano co., Cal., is 28 miles N. E. of San Francisco, at the head of ship-navigation on the Straits of Carquinez, which are two miles wide. The Central Pacific Railroad runs through the city, and trains are carried across the straits on a monster ferry-boat; the Southern Pacific Railroad also connects with the southern end of the ferry. The two great rivers of the State empty into Suisun Bay a few miles above, affording great advantages for inland trade. Benicia contains the U. S. arsenal and barracks, a Dominican monastery, St. Augustine College (Episcopalian), three young ladies' seminaries, besides the public schools and three churches. A weekly newspaper is published here. Benicia has also three large tanneries, a flour-mill, agricultural works, and quarries of limestone producing hydraulic cement. The city is elevated and healthy, with good drainage and a good supply of water. It was incorporated in 1850, and was for a time the capital of the State. Population, 1794.

BENJAMIN, Judah Peter, a lawyer and statesman, was born in 1812 in San Domingo, of Jewish parents, who soon after removed to Savannah. He studied at Yale College, and in 1831 went to New Orleans, where he was admitted to the bar in 1834. In 1852 he was elected to the United States Senate as a Whig, but soon after, on account of the increasing anti-slavery agitation, joined the Democrats, and was re-elected in 1859. He was a strong advocate of secession, and upon leaving the Senate in February, 1861, was appointed attorney-general of the provisional government of the Southern Confederacy. In August he was appointed acting secretary of war, but resigned in six months, having been censured by a Congressional committee. He retained the confidence of President Davis, and was appointed secretary of state. At the close of the Civil War he went to London, where he acquired an extensive practice in law and became a queen's counsel. In 1883 he removed to Paris, having retired from the practice of his profession. He published *A Treatise on the Law of Sale of Personal Property* (1866).

BENNIGSEN, Rudolf von, a German statesman, was born at Lüneburg, Hanover, July 10, 1824, of a noble Saxon family. He was educated in Hanover, Göttingen, and Heidelberg, and in 1845 was called to the Hanoverian magistracy. In 1855 he was elected a member of the second chamber of Hanover. Having been re-elected in 1857 by a large majority, he became the chief of an ardent opposition party, which advocated German unity and demanded a federal parliament with a strong centralized administration of the German states. In 1859 he organized the Deutsche National Verein, whose object was the attainment of German unity, and over which he presided. From 1863 to 1866 he was at the head of a parliamentary majority in favor of German unity, and when the war of 1866 broke out sought to maintain the neutrality of Hanover. The course of George V. in forming an alliance with the Austrians cost him his kingdom, which was annexed to Prussia. Bennigsen remained a chief of the Liberal national party, and still earnestly advocated a German parliamentary union. Elected to the Reichstag of North Germany and to the Prussian assembly of delegates, he became vice-president of both these bodies. During the Franco-German War he took an active part in the negotiations between North and South Germany, and he assisted at Versailles in the discussion on the basis of reconstruction of the German empire. He was elected to the German Reichstag in 1871, and again in 1874, being vice-president of that body in the sessions of 1872 and 1873, and was elected to its presidency in the end of the latter year. In the election of 1877 the Socialistic party sought in vain to defeat him. In the Reichstag in 1880 he secured the defeat of the Elbe

Navigation Act, which would have seriously injured the city of Hamburg as a free port, and as the leader of the moderate Liberals he has opposed some of the measures of Bismarck. When the home ministry, in December, 1881, declared it the duty of administrative officials to support the Government candidates, a storm was raised in the House, and Bennigsen's eloquent protest led to an effort to remove the faults of the elective system.

BENNINGTON, a village and a town in the south-western part of Bennington co., Vt. Bennington village is 57 miles S. of Rutland and 36 miles N. E. of Troy, N. Y., and is connected with those places by the Bennington and Rutland Railroad and the Troy and Boston Railroad. It has also direct connection by rail with New York *viâ* Lebanon Springs. It has five hotels, two national banks, and one weekly newspaper. Its important buildings are the courthouse, jail, the graded-school building, and the Park Home. The free library, founded in 1865, has 5000 volumes, and a large brick building used for public purposes. Hon. Trenor W. Park, one of the donors of the library, has also founded the Park Home, to be used as an orphanage and a home for old ladies. There are four churches, with good edifices. The manufactures comprise extensive woollen-mills, eight hosiery-mills, one foundry, four machine-shops, and a knitting-needle factory. The Walloomsac River, running through the town, furnishes water-power as well as facility for protection against fire. The fire department has two regular organizations, with a steam fire-engine and a hand engine. The village was incorporated in 1849, and the assessed valuation of its property is $160,000, that of the town being $320,000. The actual value is much greater, but the town indebtedness is $246,648, and that of the village $1500. The expenses for 1881 were—town $10,000, and village $2500. In population Bennington town ranks third in the State of Vermont, having 6341 inhabitants, of whom all but 79 are white, and about half are of foreign birth, chiefly Irish. The picturesque scenery of the vicinity attracts a large number of summer visitors.

When Vermont was organized as a State in 1778, it was divided into two counties, the Green Mountains being the central boundary-line. The west half was called Bennington, the eastern portion Cumberland, and each of these subdivisions had two county-seats. By an act of the general assembly, passed Feb. 13, 1781, Bennington county was circumscribed to its present dimensions, with two shires, two probate districts, and two county-seats, Bennington being that of the southern part, consisting of eight of the seventeen towns in the county. The town of Bennington was chartered Jan. 3, 1749, by Gov. Benning Wentworth of the province of New Hampshire, and named in his honor. The early settlers, however, were from Connecticut and Western Massachusetts. The Bennington village of those times, and down to 1870 the county-seat, is now called Bennington Centre, and is situated one mile west of the present village of Bennington. It contains the Old First Church (Congregational), organized in 1762, and a Roman Catholic church. This old historic Bennington is on a commanding eminence, overlooking in the valley the modern incorporated village. To the south-west rises Mount Anthony, 2346 feet above the level of the sea and 1401 feet above the site of the Old First Church. On the summit of Old Bennington stood the "State's Arms" house, in which were stored the munitions of war which a detachment from Gen. Burgoyne's army sought to capture in 1777, and thereby brought on a battle which Prescott has pronounced "one of the most decisive of the Revolutionary War."

Gen. Burgoyne's scheme was that Sir Henry Clinton, then occupying New York, should ascend the Hudson—hence the proposition to Arnold to deliver West Point into his hands—while Burgoyne should march southward from Canada, and by a junction thus effected the American forces in New England and the Middle States would be cut in two. Burgoyne had received information that the Americans had collected provisions, cattle, and horses at Bennington, and he sent a detachment under Lieut.-Col. Baume "to scour the country," to capture these supplies, to test the disposition of the people, and to levy contributions on the towns. With this detachment was a contingent of Tories and a force of Indians. Among other things, Baume was directed to bring back to Burgoyne at least 1300 horses. The British commander entirely misapprehended the temper of the people. As they had no military funds, they raised contributions to organize some defence. Langdon, the Speaker of the provincial legislature, gave $3000 and his plate; others imitated him, and two brigades were at once organized, commanded by Cols. Stark and Whipple. The former was an old officer, who, fancying himself aggrieved, had resigned his commission, but who came forward as a volunteer in this emergency. On the 13th of August, Baume was in full march for Bennington. Finding, to his surprise, that Stark's command was contesting his advance, he halted and sent back for reinforcements. These were promptly forwarded—500 men under Lieut.-Col. Breyman. The position of the contending forces was as follows: The British had occupied and lightly entrenched Bennington Heights, which were in a bend of the Walloomsac River, into which, on their left, a small stream enters; the Americans were on the other side of the river and along the road to Bennington. At the first skirmishing, on the 15th, the Indian allies, who had expected no resistance, began to desert the British. The next day, the 16th, a battle was fought. Sending detachments on both flanks to gain, if possible, the British rear, Stark attacked vigorously in front, and after two hours' hard fighting the remaining Indians were put to flight, the Tories were driven back on the Hessians, and the entire British force driven across the stream.

Baume attempted to retrieve himself by leading a new attack in person, but with no better success: again he was driven back and his artillery was captured. Then the Americans left their ranks to plunder, with almost fatal results. The reinforcements which had arrived under Breyman rallied the retreating troops of Baume, and advanced rapidly upon the dispersed Americans. Stark tried to rally them in vain; they were in full retreat, when they were met and turned back by Col. Warner with fresh militia from Bennington. The fighting continued until sunset, when the enemy fell back, and were pursued until dark. The loss of the enemy was 934, among whom were 157 Tories. Col. Baume was mortally wounded: 4 guns, 4 ammunition-wagons, and a large quantity of arms and baggage fell into the hands of the Americans. The thanks of Congress were presented to Col. Stark and his officers and men, and he was appointed a brigadier-general.

This event has been celebrated almost every year since, and in 1877 a centennial celebration was observed, at which the President of the United States, his Cabinet, the governors and legislatures of Massachusetts, New Hampshire, and Vermont, together with many prominent representatives of the army and navy and of other States, were present. The site of the "State's Arms" house has been selected as the proper one for the proposed Bennington battle monument.

BENSON, EDWARD WHITE, D. D., archbishop of Canterbury, was born at Birmingham in 1829. His father was distinguished as a chemist, and was the author of some works. The son was educated at Birmingham, and in 1852 graduated B. A. at Trinity College, Cambridge, with the highest classical honors. He then became assistant master in Rugby School, and in 1853 was ordained deacon, and in 1857 priest. In the next year, being elected head-master of Wellington College, he thoroughly organized that institution, erecting its buildings as well as conducting its educational work. In 1869 he was appointed also examining chaplain to the bishop of Lincoln, and in 1873 he was made canon residentiary and chancellor of Lincoln cathedral. He was chosen several times as select preacher at Cambridge University, and held a similar position at Oxford in 1875. His success in work connected with Lincoln cathedral marked him as a suitable person to organize the bishopric of Truro, representing a see which had been merged in that of Exeter before the Reformation, but was revived in 1876. Dr. Benson, who had received the degree of D. D. at Cambridge in 1867, was consecrated bishop of Truro April 25, 1877. Here he again displayed his organizing powers and gave great impulse to church-work. A new cathedral was commenced in May, 1880, and chancellor's schools which he had re-established in Lincoln were also founded in the new see. In December, 1882, Bishop Benson was promoted to the archbishopric of Canterbury, and on Maundy Thursday, 1883, he was enthroned. He is the author of several volumes of sermons, etc., among which are *Work, Friendship, Worship* (1871); *Boy-Life, its Trials, its Strength, its Fulness* (1874); *Single-heart* (1877). He has also written a treatise on *The Cathedral* (1879), and has contributed to *The Speaker's Commentary*.

BENSON, Egbert, LL.D. (1746–1833), a New York lawyer and judge, was born in New York, June 21, 1746. He graduated at King's (now Columbia) College in 1765, studied law, and became eminent in his profession. He was a prominent member of the Revolutionary Committee of Safety, and in 1777 was made the first attorney-general of New York. At the close of the war he was one of the commissioners to superintend the embarkation of the Tory refugees to the British provinces. He served in the Continental Congress from 1784 to 1788, was regent of the University of New York from 1789 to 1802, and judge of the supreme court of New York from 1794 to 1801. He was appointed judge of the United States Circuit Court in 1802, and was again elected to Congress in 1813, but resigned in a few months. He was the first president of the New York Historical Society, and published in 1817 a *Vindication of the Captors of Major André*, and in 1833 a *Memoir on Dutch Names of Places*. He died at New York, Aug. 24, 1833.

BENSON, Eugene, an American artist, was born at Hyde Park, N. Y., in 1839. He studied at the National Academy in New York and with J. H. Wright, the portrait-painter. Afterwards he went to Paris, and from thence to Venice. He has resided at times in New York, but has travelled extensively, and since 1871 he has been established in Rome. The best-known work of this artist is perhaps The Strayed Maskers, which has been exhibited a number of times, and which was the most meritorious of five contributions made by the artist to the Centennial Exhibition of 1876 at Philadelphia. Other of his paintings that may be mentioned are Retrospection, The Reverential Anatomist, Cloud-Towers, Merchant of Cairo, Bazaar at Cairo, Hay-Boats, Peasants of Cadore at Worship, Thoughts in Lent, A Reverie, Making the Best of it, Dead Calm on the Hill, Study of a Girl in Blue, Sad Thoughts, Interior of St. Mark's at Venice, Hashish-Smokers at Jerusalem, and The Slave's Tower. Benson, in addition to being a clever artist, is an able writer, and has been a frequent contributor to the leading magazines.

BENTON, Thomas Hart, an American statesman and author, was born at Hillsborough, N. C., March 14, 1782. When eight years old he lost his father; his education was on that account somewhat neglected, but by his natural ability and indefatigable industry he made up for his early deficiencies. Removing with his mother to Tennessee, he studied law, was admitted to the bar, and entered into a large and lucrative practice. He served one term in the legislature of Tennessee, and also became an aide-de-camp to Andrew Jackson, then major-general of the State militia. Subsequently, however, a quarrel took place between them, resulting in a personal combat with knives and pistols. A long and bitter feud followed. Early in the War of 1812, Benton raised a regiment of Tennessee volunteers, of which he was appointed the colonel. When this regiment was disbanded in 1813, he was appointed by Pres. Madison lieutenant-colonel in the regular army, and was proceeding to the seat of war on the Canadian frontier when peace was declared and he resigned his commission. Soon after this he removed to St. Louis and established the *Missouri Inquirer*, a journal of strong pro-slavery proclivities. He advocated the admission of Missouri as a slave State, and when it entered the Union in 1820, Col. Benton was elected to the United States Senate, where he served without intermission thirty years. During the Presidency of Andrew Jackson, with whom he was again on friendly terms, he was one of the conspicuous public men in the United States. He was a close student of the geography and commercial advantages of the "Far West," and was one of the earliest advocates for the establishment of lines of travel and transportation between the Valley of the Mississippi and the Pacific Ocean. Faithfully-kept treaties with the Indian tribes inhabiting that vast region, the navigation of the Western lakes and rivers, the establishment of post-roads and military stations,—all engaged his earnest thought and zealous labor. He advocated in regard to our public lands that policy whose adoption in 1862 has led to the rapid settlement and development of the West. During the political agitation caused by the determination of Pres. Jackson to overthrow the Bank of the United States and place the currency of the country upon a metallic basis, Col. Benton was the most persistent advocate of that measure, and received the sobriquet of "Old Bullion." In 1837, Col. Benton moved the "expunging resolution," which struck from the journal of the Senate a vote of censure against Gen. Jackson for his assumption of power at the time of the battle of New Orleans. When the troubles with Mexico began, which finally culminated in war, Col. Benton urged with force and energy the commencement of hostilities. He opposed the famous Compromise measures introduced by Henry Clay in 1850, declaring them unsound as to the new territory acquired from Mexico and in their application to the Fugitive-Slave Law. His opposition to Calhoun's resolutions, which were intended to provide for the extension of slavery, cost him his seat in the Senate. In 1852 he was elected to the House of Representatives, where he opposed the policy of Pres. Pierce and the Kansas-Nebraska Bill. In 1854 he was defeated for Congress by the coalition of his former political opponents, and in 1856 failed to secure the Democratic nomination for governor of Missouri. After this last defeat Col. Benton retired from public life, and devoted his time and talents to the completion of his *Thirty Years' View, or a History of the Working of the American Government from 1820 to 1850*, the first volume of which was published in 1854, the second in 1856. Immediately after finishing that vast work he commenced the laborious undertaking of abridging the debates of Congress from 1719 to 1856. He brought the work down to the great debates on the Compromise measures of 1850, and it was published in 15 vols. 8vo. He also found time to write an historical and legal examination of the Dred Scott case. His literary labors were continued till his death. When no longer able to speak aloud he dictated part of his work in whispers. He died at Washington, April 10, 1858. (E. L. D.)

BENZENE, Benzol (formula, C_6H_6), a hydrocarbon produced largely in processes of destructive distillation, and hence found abundantly in coal-tar and in similar products. Benzene occupies a very important position both in theoretical and in applied chemistry. It is the first of a series of hydrocarbons corresponding to the general formula C_nH_{2n-6} (see article on Chemistry, Vol. V.), and known as the "aromatic series." It serves as

See Vol. II. p. 485 Am. ed. (p. 560 Edin. ed.).

the starting-point, moreover, of many thousand derivatives, which, under the common name of "aromatic compounds," are widely spread in the vegetable kingdom. In applied chemistry it serves as the basis for the manufacture of nitro-benzol and aniline, and with these of the many aniline dye-colors; from it, more remotely, are produced many compounds of medicinal value, like benzoic and salicylic acids; and it is very probable that in the near future numbers of the alkaloids will be derived from it or its substitution compounds. As just stated, it is a general product of destructive distillation. Thus it is formed from turf, wood, resins, and coal, and is found naturally in certain petroleums. In ordinary practice, however, it is obtained from that portion of coal-tar which distils between 60° C. and 150° C., and which is known as the "light oil." This fraction, constituting 35 per cent. of the crude tar, yields an amount of pure benzene equal to 1·5 per cent. of the tar. The remainder consists of the homologues of benzene, such as toluene (C_7H_8), cylene (C_8H_{10}), and mesitylene (C_9H_{12}), together with small amounts of olefine and acetylene hydrocarbons. To free the benzene from these, the "light oil" is agitated with dilute acid and alkali alternately, and then treated at 105° C. with 5 per cent. of strong sulphuric acid to remove the olefines and acetylene. The residual oil is then submitted to fractional distillation, and that part which comes over below 90° C. is caught separately. If this be chilled by a freezing mixture, pure benzene crystallizes out, and may be drained free from the other hydrocarbons. For commercial uses, pure benzene is not necessary, a benzene of 30 to 40 per cent. being used for the manufacture of some aniline colors, and a 90-per-cent. benzene most generally. In the manufacture of aniline oil, the crude material used for the fabrication of aniline colors, the benzene is first changed into nitro-benzene by the action of strong nitric acid, and the nitro-benzene into aniline (or amido-benzene) by the action of reducing agents. (See article on ANILINE, Vol. II.) Benzene may also be formed synthetically in a variety of ways; as. for example, by the distillation of benzoic or phthalic acid with an excess of quicklime; by the distillation of phenol or carbolic acid with zinc dust; by the action of a red heat on acetylene (C_2H_2), whereby the molecule is trebled, $3C_2H_2$ yielding C_6H_6.

Pure benzene is a colorless, highly refractive, and very limpid liquid of a slightly aromatic odor. When chilled to below 0° C. it solidifies to a brilliant mass of white crystalline tufts which melt at 5·5° C. It boils at 80° C., emitting a vapor which is very inflammable and burns with a bright yellow flame, with liberation of abundance of soot or free carbon. Benzene is nearly insoluble in water, but mixes in all proportions with alcohol, ether, chloroform, petroleum, naphtha, turpentine, and fixed and volatile oils. It is very valuable in the arts because of its solvent power for gutta-percha, india-rubber, gums, resins, fats, and fatty acids. It also dissolves sulphur, phosphorus, and iodine. (S. P. S.)

BERBERRY, in botany BERBERIS, the type of the small natural order *Berberidaceæ*, an order closely related to *Ranunculaceæ*, but the parts of the inflorescence are definite instead of indefinite. There are but two, four, or six sepals, and as many petals, which are arranged opposite the sepals—a very unusual feature in flowers. The ovary is solitary, probably from abortion, as two have been found in *Podophyllum*, a member of the order, in Ohio. The order comprises about a dozen genera, chiefly natives of the north of Europe, Asia, and the American continent. The largest part of the order is, however, found under *Berberis*, or the true Berberry. The best known is the European Berberry, *Berberis vulgaris*. This has been introduced into America, and is now so common in some of the New England States as to appear indigenous. *Berberis Canadensis* is a closely-allied species found in the Southern Alleghanies, but not extending to Canada. On the Pacific coast, and extending east to the Rocky Mountains, there are evergreen forms with pinnate leaves, which Nuttall distinguished from the Berberries under the name of *Mahonia*, given in honor of Bernard McMahon of Philadelphia, author of the first comprehensive work on American gardening. Modern botanists make it but a section of *Berberis*. The Berberry has been a famous plant in its time. It is the *Lycion* of Dioscorides, and some of the species are still used in India as a febrifuge, as they were in the most ancient times. An extract of the root and stem was used in ophthalmia. It has been regarded up to quite recent times as a good remedy for jaundice, but this reputation perhaps arose from the color of the bark, resembling the skin in that disease; and indeed all the famous medical virtues attributed to the plant can perhaps be as well found in any other astringent. The leaves and berries contain a small portion of oxalic acid. The fruits, boiled in sugar, make a good jelly, and preserved berberries were once very popular till the cranberry superseded them. In some parts of Europe the inner bark, with alum, was used to dye yellow some of the finer kinds of leather. The *Mahonia* section have black fruit, and some of the more vigorous forms are known on the Pacific coast as "Oregon Grape," and to the Mexicans as "*Leña Amarilla.*" The Berberry has been of special interest to the student of plant-life. The thorns under the leaves are formed of the midribs of true leaves, and the leaf as we see it arises from an arrested branch—a spur—in the axil of this metamorphosed leaf. The stamens are carried down by the expanding petals, and held there till liberated by a visiting insect, when they spring up and scatter the pollen. Linnæus saw in this an admirable contrivance for effecting self-fertilization by the flower. Modern botanists, however, see in the fact an arrangement for cross-fertilization. The pollen is believed to be scattered over the intruding insect, which carries it to the next flower, brushing some of the pollen on to its stigma before the anthers are liberated, which may then discharge pollen on the insect for some other flower.

BEREA, a village of Cuyahoga co., Ohio, is 12 miles S. W. of Cleveland, on the Rocky River, and on the Lake Shore Railroad and the Cleveland, Columbus, Cincinnati, and Indianapolis Railroad. It is the seat of Baldwin University (Methodist Episcopal) and German Wallace College. It has two banks (one national), seven churches, public schools, a weekly newspaper, a street-railway, and extensive quarries of sandstone from which large quantities of grindstones, building stones, and flagging are shipped. Population, 1682.

BEREA COLLEGE is finely situated in the southern part of Madison co., Ky., 100 miles directly south of Cincinnati. It owes its origin to John G. Fee, son of a Kentucky slaveholder, who while studying theology at Lane Seminary, Cincinnati, became convinced of the great sinfulness of American slavery. An irresistible conviction settled upon him that he must relinquish his idea of becoming a foreign missionary and give his life to his native State. Though he was turned out of his home, disinherited, and disowned, many people heard him, and two anti-slavery churches were soon organized in the northern part of the State. His anti-slavery manual was circulated, and his work became widely known. In 1856, at the invitation of Cassius M. Clay, he visited Madison county, and, on account of its central position, remained, organizing a church and a school in which the principles of freedom might be freely discussed. This excited opposition, yet some slaveholders patronized the school. Two years later, under the supervision of Rev. J. A. R. Rogers, sent by the American Missionary Association, the school became prosperous and popular. It closed its first session with 96 pupils and great enthusiasm.

But the constant anti-slavery discussions disturbed the surrounding community and excited great animosity. After the raid of John Brown inflammatory falsehoods were published, and Berea denounced as a dangerous power. A large county convention sent a committee of sixty-five prominent men to remove the school. The committee rode into the quiet neighborhood, and left with Prof. Rogers's and ten other families imperative orders to leave the State within ten days. An appeal to the governor failed, and the embryo college was suspended till American slavery had passed away. Immediately after the war the school was revived. A few months later two or three colored pupils were admitted, and the same hour half the white students left. But their vacant places were soon filled with colored youth. After a few months the departed began to return, and within two years all or nearly all had resumed their connection with the school.

For fifteen years the number of students has averaged about three hundred a year: the catalogue for 1882 numbers 402; average age, eighteen. Once or twice the white students have outnumbered the colored, but generally about three-fifths are colored. In a less ratio the male students outnumber the female. By the regulations of the college no distinction whatever is made on account of color. The students recite in the same classes, sit at the same tables, occupy the same buildings, and meet in the same social gatherings. No friction worthy of notice arises from this relation of the races, and no school in the country is more easily managed.

The president is Rev. E. H. Fairchild, who began his work here in 1869. The teaching force consists of five men and seven women, with occasional assistants. There are at present eleven trustees, seven of whom are residents of Berea. The property of the college consists of buildings and fifty acres of land, valued at $85,000, together with endowments amounting to $100,000. The college is undenominational, but thoroughly religious. There is no college church; college and community are united in all religious services, and the harmony between them is very satisfactory.

The chief work of the college thus far has been to furnish teachers for colored schools and mountain-schools. More than half the teachers of the colored schools of the State have been educated here, and many are furnished for other States. The mountain work is not less important.

The college, though not thoroughly indorsed by the former slaveholders, is still regarded with favor by the most respectable portion of the community. Many of the committee of expulsion are socially friendly with members of the faculty and board of trustees. The commencements are usually attended by three thousand people, of whom two-thirds are white, and among them are many of the wealthy and educated families of the county. No ostracism is visited upon the teachers, and but little upon the students. (E. H. F.)

BERGH, Henry, the founder of the American societies for the prevention of cruelty to animals, was born in the city of New York in 1823. The family is of German origin, and first came to America about 1740, settling near Staatsburg on the Hudson. Christian Bergh, the father of Henry, was a naval architect, and constructed numerous merchant-vessels and some war-vessels. Henry, after completing his studies at Columbia College, devoted himself to literature and produced several plays, tales, and sketches. During twelve years spent abroad he visited many parts of Europe and travelled extensively in the East. In 1862 he was appointed secretary of the American legation at St. Petersburg, but was compelled to resign, owing to the severity of the climate. He then determined to devote the rest of his life to the protection of dumb animals, and while in England conferred with Lord Harrowby on the subject. In 1864 he arrived in New York, spent a year in maturing his plans, and then began openly to work. The first American society was incorporated April 10, 1866, and branches have since been formed in most of the States and Territories. Mr. Bergh at first attended personally to the prosecution of cases in the courts, and for this purpose was appointed a special attorney both by the State and by the county. In 1871, Louis Bonard, a native of Rouen, who had come to America a poor man, and had acquired wealth in trade, believing he had no relatives living, bequeathed to the society his entire property, amounting to $150,000. Mr. Bergh has constantly advocated the cause of animals by public addresses and lectures and by appeals to public bodies and prominent men in Church and State. He has introduced many reforms in the methods of transporting cattle and preparing them for food, and has made those who use animals feel the wholesome restraint of the law in matters pertaining to their treatment. Out of this special humane labor also has grown another institution of great public benefit, the Society for the Prevention of Cruelty to Children, which is becoming as widely successful as the original.

BERGMANN, Friedrich Wilhelm, a distinguished linguist, was born Feb. 9, 1812, in Strasburg, where he studied Protestant theology and the Semitic languages. After taking the degree of bachelor of theology in 1834, he continued his philological studies in Göttingen, Berlin, and Paris, took the doctor's degree in 1838, and has since then been professor of foreign literature in the University of Strasburg. His works are very numerous: *De religione Arabum anteislamica* (1834); *De linguarum origine atque natura* (1838); *Théorie de la quantité prosodique* (1838); *Les peuples primitifs de la race de Japhet* (1853); *Les Scythes les ancêtres des Peuples germaniques et slaves* (1858); *Les Gètes, ou la filiation généalogique des Scythes aux Gètes et des Gètes aux Germains et aux Scandinaves* (1859); *Origine et signification du nom de Franc* (1866); *De l'influence exercée par les Slaves sur les Scandinaves dans l'antiquité* (1867); *L'unité de l'espèce humaine et la pluralité des Langues primitives* (1864); *De l'unité de composition grammaticale et syntactique dans les différentes familles des langues* (1865); *Curiosités linguistiques* (two articles, 1870); *Sprachliche Studien* (1872); *Résumé d'études d'Ontologie générale et de Linguistique générale* (3d ed. 1875); *Cours de Linguistique* (1876); *La Fascination de Gulfi* (2d ed. 1871); *The Poems of the Elder Edda in the original, with French and German translations* (1858–79); *Du génie des Races germaniques* (1859); *De l'origine et de la signification des Romans du Saint-Graal* (1840); *Dante, sa Vie et ses Œuvres* (1866); *Dante et sa comédie* (1866); *La Vision de Dante au Paradis terrestre* (1865); *Les prétendues maîtresses de Dante* (1869); *Explication de quelques passages faussement interprétés de la comédie de Dante* (1865); *Erklärung von Inferno iii. 25–60* (1877); *La Priamèle dans les différentes Littératures anciennes et modernes* (1868); *Thesen zur Erklärung der natürlichen Entstehung der Ursprachen* (1879); *Les Amazones dans l'histoire et dans la fable* (1852); *Strassburger Volksgespräche* (1873). (R. B. A.)

BERGSÖE, Wilhelm Jorgen, a Danish novelist, poet, and naturalist, was born Feb. 8, 1835, in Copenhagen, where he studied first medicine, and later natural sciences, especially zoology, and went in 1862 to Italy to study the fauna of the Mediterranean Sea. After his return he published *Philichthys Xiphiæ* (1864), *Ueber die italienische Tarantel und den Tarantismus im Mittelalter und in neueren Zeit* (1865). The constant use of the microscope injured his eyes and made him blind for some time. In his involuntary retirement from zoological studies he turned his mind to poetry, and dictated his celebrated collection of stories, *Fra Piazza del Populo* (3 vols., 1866; 4th ed. 1880), which was followed by his volume of poems *Waxing and Waning* (3d ed. 1873). During a second sojourn in Rome, where he partially recovered from his blindness, he partly wrote and partly dictated his romance, *From the Old Factory* (3 vols., 1869; 2d ed. 1879). Then followed *In the Sabine Highlands* (1871), a collection of stories in the form of letters; *Italian Novels* (1874); *In the Gloaming* (1876); *The Bride of Rörvig* (1872); and two volumes of poems, *Homesick* (1872) and *Floral Vignettes* (1873). His stories are deservedly popular. They evince a keen observation and a vivid imagination, and are written in a charming style. The most of them have appeared in two rival translations in Germany. In *From Field and Grove* (3 vols., 1880) he has published a series of popular descriptions of insects, articles written many years ago, but now for the first time given to the public. In 1872 he went for the third time to Rome to finish his studies for his great work, *Rome under Pius IX.* (1874–79). (R. B. A.)

BERKELEY, a village of Alameda co., Cal., is on the eastern shore of San Francisco Bay, 11 miles N. E. of San Francisco, from which it is reached by the boats and trains of the Central Pacific Railroad. It is the seat of the University of California, chartered and organized under control of the State in 1868; in connection with this is a preparatory school called the Berkeley Gymnasium. There are also good public schools, a deaf, dumb, and blind asylum, four churches, and a weekly newspaper. It is elevated, healthy, well supplied with water, and lighted with gas.

BERLIN, a city of Green Lake co., Wis., is on Fox River, 96 miles N. W. of Milwaukee, at the terminus of a branch of the Chicago, Milwaukee, and St. Paul Railroad. It has a national bank, a park, nine churches, a high school and three graded schools, two weekly newspapers, a fire department, and a good supply of water. It has a foundry, flour-mills, whip-factories, saw-mill, woollen-mill, tanneries, boot- and shoe-factory, pump-factory, several wagon- and carriage-factories, etc. It is surrounded by an excellent farming and grazing country, in which are four cheese-factories, and an extensive cranberry district yielding 25,000 barrels annually. Population, 3353.

BERNARD, Claude (1813–1878), an eminent French physiologist, was born at St. Julien (Rhône). July 12, 1813. His parents were poor, and he had difficulty in obtaining an education. He studied medicine in Paris under the learned physiologist F. Magendie, and graduated in 1843. He studied surgery until 1853, after which he gave his attention solely to experimental physiology. His reputation began with his important *Researches on the Uses of the Pancreas*, which gained him the grand prize of the Institute in 1849. In 1854 he became a member of the Institute and professor of physiology in the faculty of sciences. In 1855 he was appointed professor of experimental physiology in the College of France, and in 1868 professor of general physiology at the Museum. He became grand officer of the Legion of Honor in 1862, and commander in 1867; a member of the French Academy, to succeed Flourens, in 1868; and a member of the senate in 1869. He died in Paris, Feb. 10, 1878.

The discoveries in physiology of M. Bernard were of great importance, and have given a new direction to experimental research in that science. His most important works are *Leçons de Physiologie expérimentale* (1855); *Recherches expérimentales sur le grand sympathique*, etc. (1854). This work brought him for the third time the grand prize of the Institute, the second prize being for *La Fonction glycogénique du Foie*. We may also name *Leçons sur les Effets des Substances toxiques et medicamenteuses* (1858); *Leçons sur la Physiologie et la Pathologie du Système nerveux* (1858); *Leçons sur les Propriétés physiologiques et les Altérations pathologiques des différents Liquides de l'Organisme* (1859); *Leçons et Expériences physiologiques sur la Nutrition et la Développement* (1860); *Leçons sur les Propriétés des Tissus vivants* (1865); *De la Physiologie générale* (1872), a work honored by the Academy prize; *Leçons de Pathologie expérimentale* (1872); *Leçons sur les Anesthesiques et sur l'Asphyxie* (1875); *Leçons sur la Chaleur animale et sur la Fièvre* (1875); *Leçons de Physiologie operatoire* (1879); etc.

BERNE-BELLECOUR, Étienne Prosper, a French artist, born at Boulogne-sur-Mer, June 29, 1838. He studied under Picot and Barrias, and first exhibited at the Salon in 1861. His first works were landscapes and portraits, but he afterwards devoted himself mainly to military subjects, although he has painted a number of *genre* pictures. Of his best works may be mentioned Désarçonné, Un Coup de Canon, Un Nid d'Amoureux, Le Jour de Fermages, Le Prétendu, Les Tirailleurs de la Seine au Combat de la Malmaison le 21 Octobre, 1870, La Brèche, La Desserte, and Dans la Tranchée. He has received medals in 1869 and 1872. Berne-Bellecour is one of the best of the later school of French military painters. He is a more careful draughtsman than De Neuville and has greater freedom of handling than Detaille—these artists being his principal rivals—and his compositions are remarkable for their vigor and for the impression which they give of being accurate transcripts of realities.

BERSERK. This word is usually explained as derived from *berr* (bare) and *serkr* (cf. sark = shirt); but Vigfussen considers this etymology inadmissible, because *serkr* is a noun. He prefers to derive it from *berr* (Germ. *bär* = ursus), since in olden ages athletes and champions wore hides of bears, wolves, and reindeer. The berserks were wild warriors or champions in the heathen age of the North. Twelve berserks are mentioned as the chief followers of several kings of antiquity; *e. g.*, of the Danish king Rolf Krake. In battle the berserks were subject to fits of frenzy called *berserksgángr* (*furor berserkicus* = berserk rage), when they howled like wild beasts, foamed at the mouth, and gnawed the iron rims of their shields; during these fits they were, according to popular belief, proof against steel and fire, and made great havoc in the ranks of the enemy. But when the rage was over they became correspondingly tame and weak. (See Cleasby's *Icelandic-English Dictionary*, *sub voce*, and Anderson's *The Younger Edda*, pp. 214–217.)

BERT, Paul, a French physiologist and statesman, was born at Auxerre, in Yonne, France, Oct. 19, 1833. He studied at Paris, and was licensed in law in 1854, but afterwards turned his attention to medicine, obtaining a doctor's degree in 1863 with a thesis on *La Greffe animal*. He was assistant to Prof. Claude Bernard in the College of France till 1866, when he received the degree of doctor of natural sciences with a thesis on the *Vitalité des Tissus animaux*. In 1867 he was made professor in the Faculty of Sciences at Bordeaux, devoting himself to physiology, and in the next year supplied the place of Flourens at the Museum of Paris. In 1869 he succeeded to the chair of physiology in the Faculty of Sciences at Paris. On the downfall of Napoleon III., in Sept., 1870, M. Bert entered political life as an ardent Republican. He was at first made secretary of the prefecture of Yonne, his native department, and in the following January became prefect of the North, which office he resigned on the retirement of M. Gambetta from the ministry of war. From Oct., 1871, to 1879 he represented the canton of Aillant in the council-general of Yonne, but at last resigned this place on account of the pressure of other duties. He was elected to the Chamber of Deputies June 9, 1874, and at once became active on questions concerning public instruction. He was the author or supporter of laws establishing the superior council of education, founding faculties of medicine at Lyons and Bordeaux, organizing primary instruction, pensioning teachers, etc. By his efforts a pension of 12,000 francs was bestowed on M. Pasteur for his useful discoveries. M. Bert was re-elected in Feb., 1876, and in Oct., 1877, by large majorities, and finally in Aug., 1881, without opposition. Continuing in the course he had already marked out, he introduced laws relating to higher education in Algiers, and to the remodelling of primary instruction throughout France, removing it from the control of the priests and religious orders, and making it compulsory. In March, 1876, he was made a member of the committee on historical works and learned societies. In April, 1880, the Faculties of Science appointed him a member of the superior council of public instruction. He was also, under Pres. Gambetta, minister of public instruction and of worship from Nov. 14, 1881, to Jan. 26, 1882. He introduced a great number of changes in all branches of primary instruction, and carried on an energetic policy against the Roman Catholic Church. As a member of the Chamber he still is working in the same direction. The activity of his political career has not prevented him from continuing his labors as a physiologist both in teaching and in original investigation. He made numerous experiments in regard to the effect of variations of barometric pressure on the phenomena of life; and for his researches and publications on this subject the Academy of Sciences awarded him in 1875 the biennial prize of 20,000 francs. In Dec., 1878, he succeeded M. Claude Bernard as president of the Society of Biology. He was elected a member of the Academy of Sciences April 3, 1882. He has contributed numerous papers of great value to the *Comptes Rendus* of the Academy of Sciences, the Society of Biology, and the *Société Philomathique*, and popular scientific articles to the *République française.* His most important publications are—*Revue des Travaux d' Anatomie et de Physiologie publiés pendant l' Année 1864* (1866), *Notes d' Anatomie et de Physiologie comparées* (1867–70), *Leçons sur la Physiologie comparée de la Respiration* (1869), *La Pression barométrique, recherches de Physiologie expérimentale* (1877), *Revues scientifiques publiés par la République française* (1879–82), *Leçons de Zoologie, proferées aux jeunes filles* (1880). His recent publications include—*La Morale des Jésuites* (1880), *Leçons, Discours, et Conférences* (1880), *Discours parlementaires* (1881), *La Législation de l' Enseignement primaire* (1880), *La Première Année d' Enseignement scientifique* (1881), *L' Instruction civique à l' École* (1881), *L' Instruction réligieuse à l' École* (1881).

BERWICK, a borough of Columbia co., Pa., is on the W. bank of the Susquehanna River, 12 miles E. of Bloomsburg and 27 miles S. W. of Wilkesbarre, on the Bloomsburg division of the Delaware, Lackawanna, and Western Railroad. On the opposite side of the river, which is crossed by a wooden bridge, the North and West Branch Railroad gives additional means of access. It has three hotels, a national bank, a public hall, two weekly newspapers, four churches, and seven schools, with a good building. It has a rolling-mill, large car-works, a foundry, planing-mill, and other industries. It was laid out by Evan Owens in 1786, and incorporated in 1818. It is surrounded by an agricultural country, is pleasantly situated 300 feet above the river, and has good water-works. Its property is valued at $366,000, and its yearly expenses are $2400. It has recently taken a fresh start as a manufacturing town. Population, 2095.

BESSEMER, Sir Henry, an English inventor of Breton extraction, was born at Charlton, Herts, Jan. 19, 1813. His father was an artist and a member of the French Academy of Sciences. In early life he devoted much time to the improvement of machinery, and an ingenious contrivance invented by him to prevent the fraudulent transfer of stamps from old documents to new ones is said to have saved to the British Government an immense sum of money. His reputation as an inventor, however, rests particularly upon his method for the manufacture of steel devised in 1856–58, in which iron is purified from carbon by the direct introduction of oxygen. This discovery has proved of the highest industrial value, and has effected a revolution in the processes of steel manufacture. Mr. Bessemer has become very wealthy through the extensive use of this invention, and has received medals and testimonials of honor from all the European nations. In 1871 he was elected president of the Iron and Steel Institute of England. The Bessemer-steel process is largely employed in America. The effect of its introduction has been to cheapen the manufacture of steel, so as to permit of its advantageous employment in railroad-building, and the iron rails upon all the important lines are now being rapidly replaced with steel. Sir Henry has proposed a method of utilizing the coal-dust which has so long been regarded at the mines as waste. He has also been engaged upon other inventions. In 1879 he was elected a fellow of the Royal Society, and in the same year received the honor of knighthood.

BETHLEHEM, a borough of Northampton co., Pa., is on the N. bank of the Lehigh River, 12 miles from its junction with the Delaware at Easton. It is 54 miles N. of Philadelphia and 87 miles W. of New York City. It is a terminus of the North Pennsylvania Railroad, which connects it with Philadelphia. It is connected with New York by the Lehigh Valley Railroad and by the New Jersey Central, both of which extend far to the west and north. It is also a terminus of the Lehigh and Lackawanna Railroad. It has seven hotels, two national banks, one daily and two religious weekly newspapers, nine churches, a theological seminary, a high school, common schools, and private seminaries. The Moravian seminary for young ladies has been patronized by all sections of the United States. The town has water-works and is lighted with gas. The industrial works are flour-mills, and factories for making shovels, boilers, brass implements, and cigars. The situation is healthy and beautiful, and the scenery is very picturesque. The old cemetery in the midst of the town is remarkable for the uniformity of its graves, laid out in rows, and each one marked by a flat stone, no distinction being allowed. Nisky Hill is a large and beautiful park overlooking the river, and a portion of it is a public cemetery. The property of Bethlehem is estimated at $3,000,000. Population, about 5200.

Bethlehem is the principal settlement in America of the Moravians, or "United Brethren" (*Unitas Fratrum*), who still retain many of their original characteristics. A small party of them came to the site of Bethlehem in December, 1740, on a purchase of 500 acres from William Allen, which by subsequent purchases was largely increased in extent. The first house was finished in the spring of 1741—a cabin of hewn logs 40 feet by 30, with a peaked gable and a projecting roof—and remained until 1823, when it was taken down. Other houses followed in quick succession, one of which is still standing in Church Street. This was occupied by the bishop and clergy, and to it the Indians came on business and to receive religious instruction. Their bishop, Nicholas Lewis, count of Zinzendorf, arrived in the new settlement in 1741, in time to keep with the little band in the first house the festival of the Nativity.

The Moravians in Bethlehem adopted for a period of twenty years a community, not of property, but of labor. This was called "the Economy," and was abandoned because it proved to be not economical, but expensive. The present Moravian church-building was begun in the autumn of 1802, and consecrated in 1806. The auditorium, a large one for that time, is 90 feet by 60, and 34 feet to the top of the arch. It was entirely renovated in 1867. For a long time the congregation had but one store—"the old store" at the corner of Main and Market Streets. The first tavern was the Crown Inn, built in 1743 on the south side of the Lehigh River; it was moved to the other side to make room for a railroad station. The Sun Inn, built in 1758–59, occupied in 1760, and since enlarged, is still standing; it belonged to the congregation until 1848. During the American Revolution the general military hospital was established in the young ladies' seminary. While hostilities continued the town was visited by Washington and other prominent patriots. La Fayette, after being wounded at the battle of the Brandywine, was brought to Bethlehem, and was nursed to recovery. In the sisters' house was embroidered the banner of Count Pulaski. It was in reality only a guidon, half a yard square; it may now be seen in the rooms of the Maryland Historical Society at Baltimore.

For a long time the congregation refused to sell any part of their lands to persons outside their own number, but this exclusive system was abandoned at a meeting of the council Jan. 11, 1844, and they have since alienated a large portion of their territory. On Aug. 21, 1882, the one hundred and fiftieth anniversary of their foreign missions was celebrated by a jubilee at Bethlehem. (H. C.)

BÉTON, BÉTON-AGGLOMÉRÉ, BÉTON-COIGNET, and **CONCRETE,** are terms applied to artificial stones composed of an intimate mixture of a mortar of hydraulic or common lime with some inert materials, such as gravel, coarse sand, broken bricks, stone, or shells. In mixing the ingredients great care must be taken to have every particle of stone imbedded in the mortar used as a matrix, so that the quantity of mortar must be slightly in excess of the void spaces in the inert materials. The quantity of water used should be just sufficient to produce a stiff paste when rammed, without forming a scum on the surface. Skilled labor or machinery should always be used in the mixing to ensure good results. The proportions of the ingredients will depend upon the use and strength required. When hydraulic cement is used as a gangue, the béton gradually acquires the hardness of ordinary sandstone, and is used in a great variety of structures, such as foundations and walls of all forms and descriptions, arches, bridges, sewers, roofs, fortifications, pavements, aqueducts, and marine structures.

See Gillmore, *Coignet Béton and Limes;* Beckwith, *Béton-Coignet;* Bowman, *Method of Mixing Concrete,* etc.

BETTING. A bet is a contract between two or more persons by which one agrees to suffer a certain forfeit on the happening or non-happening of a certain event or thing therein particularly specified, the forfeit to enure to the party winning. This practice has been condemned and prohibited by the law from times as early as the Roman Republic. Men have in the abstract the undoubted right to dispose of their effects in whatever manner they see fit, but betting is made illegal because fraud and other evil doings follow closely upon it, and the seductive prospects held out have often opened the way to crime by promoting that disregard for the law which too often ends in some flagrant breach of it.

The various States of the United States by statutory enactments have adopted the common-law provision and made betting indictable. Legislative acts have made it a punishable offence to keep a house to which people may resort for the purpose of betting on cards or other games of chance, on account of its tendency to bring together disorderly persons, to promote immorality, and to lead to breaches of the peace; and in a number of instances these laws have declared that money staked in betting cannot be recovered by the winner in an action at law. It has been held in the States of Connecticut, Delaware, Illinois, Indiana, Iowa, and Maryland that a promissory note made payable when a person receives the electoral vote of the State is a bet on an election, and consequently void, and that betting in all its phases is void, as being the making of a contract against good morals and without a good or valuable consideration. In New York and Pennsylvania a wager on a horse-race is void. By the laws of California and Texas a wager is not recoverable in an action at law. Stakeholders in most of the States may be compelled to refund stakes deposited on an illegal wager, notwithstanding that payment has been made to the winner. In 1870 in the State of Illinois it was held that an indorsement of commercial paper given in payment of a bet, though in the hands of an innocent holder for value, is void and non-recoverable. In the State of Pennsylvania an action to recover money won on a bet cannot be maintained; and it is also held that a contract between parties to share jointly in the profits and losses of a stock-gambling adventure is contrary to public policy and good morals, and therefore incapable of enforcement in a court of justice. Thus it will be seen that the laws generally prohibit betting, and bar the winner from recovering at law the stakes won. In some few of the States, where there are no direct laws prohibiting betting, courts are nevertheless suspicious of it, and throw around the transaction all possible barriers in order to maintain that integrity of public morals which is necessary to the well-being of a commonwealth or people. (F. H.)

BEUST, BARON FREDERICK FERDINAND VON, a distinguished Saxon and Austrian diplomatist and statesman, of an illustrious family of Brandenburg which had settled in Dresden, Saxony, was born Jan. 13, 1809. His early education was received at Dresden, and his later studies were made at the universities of Göttingen and Leipsic. In the former he enjoyed the instruction of many distinguished professors, among whom was the distinguished philosopher and historian Heeren. In the latter he studied philosophy and public law. As soon as his course was completed he entered the Saxon Foreign Office. In 1832 he was appointed an assessor of land surveys, and to increase his stores of knowledge he travelled for three years in France, England, and Switzerland. On his return he entered upon a diplomatic career, in which his promotion was unusually rapid. In 1836 he was sent as secretary of the Saxon legation to Berlin. In 1838 he was transferred with the same rank to Paris. In 1841 he was *chargé d'affaires* near the Bavarian court at Munich, where he married the daughter of the Bavarian general Jordan. In 1846 he was sent as minister resident to London, and in 1848 was transferred as ambassador to the court of Berlin. In Feb., 1849, he was recalled to Dresden and appointed minister of foreign affairs. He took a prominent part in the events of that disturbed period. On the occasion of an *emeute* in the streets of the capital, as the greater part of the Saxon army was employed in Schleswig-Holstein, he called upon the Prussian troops to aid in restoring order. The Saxon sovereign, Frederick Augustus II., left Dresden and took refuge at Königstein. A provisional government was declared, with Zschinsky as president and Von Beust as prime minister. He added to his other duties the portfolio of agriculture. Upon the death of Zschinsky in 1853, he became titular president of the provisional government until the accession of John, the brother of the preceding monarch, whom he served as chief councillor. In 1863, incident to the death of Frederick VII. and a disputed succession, the Danish war broke out. The evident purpose of Prussia and Austria with regard to the disposition of Schleswig and Holstein excited great concern among the secondary German states, and particularly in Saxony. The greater powers were disposed to make an arbitrary division of the provinces and people according to the German element; while the states of Saxony, Hanover, Bavaria, and Würtemberg desired to support the claims of the duke of Augustenburg to the duchy of Holstein. Von Beust entered a bold protest, and advised an armed neutrality of the dissenting provinces. This was, however, impracticable. The Prussian victory at Sadowa in 1866 thrust Austria out of the *Bund* and placed all the rest of Germany at the feet of the conqueror. Von Beust had represented the German Diet at the London conference in 1864, and had afterwards been cordially received by the emperor Napoleon III. at Fontainebleau. At the close of the war, on the 19th of Aug., 1866, Bismarck having refused to let him take part in the negotiations for peace, he resigned from the Saxon ministry to enter the service of Austria. He was invited by the emperor Francis Joseph to take the office of minister for foreign affairs, and upon the resignation of Count Belcredi he became chancellor of the Austrian empire. To Prussia that might have seemed a menace or a show of personal hostility, but it soon became manifest that this transfer of allegiance only covered an honest purpose to regenerate Austria and rescue her from destruction. He entered upon his duties with great boldness and promptitude, and in a very liberal spirit. He counselled and proclaimed such wise concessions to Hungary as led to an entire reconciliation with the Magyars and a satisfactory agreement with the Slavic races under the new Austro-Hungarian monarchy: amid great rejoicings the Austrian emperor was crowned king of Hungary at Pesth on the 8th of June, 1867, when the title of the empire was changed from Austria to Austria-Hungary. One liberal measure followed another in quick succession at the magic word of the new chancellor. Himself a Protestant, he was entirely hostile to religious partisanship in public affairs. In the Reichsrath, or parliament, he procured the legislative assent to the entire and final separation of Church and State, making all forms of religious belief equal in the eye of the law. He caused the Jews to be admitted to all civil and religious rights. He repudiated the concordat entered into with the pope in 1855. He established civil marriages, which led to his receiving popular ovations at Vienna and anathemas at Rome. In 1868 he added greatly to his popularity by abolishing imprisonment for debt and establishing a law that all suits concerning the press should be tried by juries. He greatly improved the condition of the finances, which he found in a most deplorable state, and rearranged the composition of the army. In 1868 he was voted the freedom of the city of Vienna as honorary burgess. In 1870 he objected strongly to the plan of placing a prince of Hohenzollern on the throne of Spain, with all resulting issues. During the Franco-Prussian war he succeeded in keeping Austria out of the struggle, when all the rest of Germany was combined against France. After the fall of the French Empire he sympathized heartily with the government of M. Thiers, and, although courteous to Prussia in an interview between King William and Prince Bismarck on the one side and Francis Joseph and himself on the other, he objected to the German consolidation, but without effect. In 1871 he resigned the chancellorship, and was appointed by the emperor a life member of the upper house of the Reichsrath for meritorious services. He was sent in that year as Austrian ambassador to England. In 1878 he was transferred to Paris. (H. C.)

See Vol. III. p. 548 Am. ed. (p. 634 Edin. ed.).

BIBLE. In the current critical discussions, as distinguished from theological discussions, there are two schools of opinion concerning the Bible. On the one hand, most scholars regard the books of the Bible as historical wherever they appear on their face to be so, and therefore as proving the existence, very early in human history, of wonderfully ripe and exalted types of religious ideas. On the other hand, a body of eminent men, among whom are Kuenen, Graf, Reuss, and Wellhausen, regard the Bible and the religion it contains as having developed, by an evolution which constantly advanced from lower forms to higher, without the interference of what are commonly called supernatural elements, and, as a necessary concomitant of this view, deny to its books anything like a proper historical character.

It would be unfair to affirm that the article above referred to is written from this latter point of view. But in its treatment of the Old Testament it has obviously been influenced by this school of criticism, and a statement of the opposite view is made necessary by the radical differences between the two schools of critical opinion.

The article in question, after mentioning that Josephus counted the books of the Old Testament as twenty-two, and that the Jewish tradition finally settled upon twenty-four as being the true number, speaks of "the expansion of the Talmudic twenty-four to the thirty-nine Old-Testament books of the English version." Language like this has misled many into thinking that our division of the Old Testament into thirty-nine books is more recent than the division into twenty-two or into twenty-four, and was formed by subdividing some of the books of that older division. Exactly the reverse of this is the truth. Up to about 400 A. D. the number is more frequently said to be twenty-two than twenty-four. But the twenty-two and the twenty-four alike are counted as a grouping of the thirty-nine books. Several Christian witnesses of the fourth century mention the thirty-nine books by their names, and explain how they are grouped together so as to reduce the number to that of the letters of the Hebrew alphabet. At the beginning of the third century Origen mentions them all by name except the twelve minor prophets. In the second century Melito mentions them all by name except Lamentations, Nehemiah, Esther, and the minor prophets, which he describes as "the twelve in one book." In the first century or earlier the twelve minor prophets are mentioned by name in 2 Esd. i. 39, 40. As far back as there is any evidence in the matter our present thirty-nine books are separately counted.

The article in the ENCYCLOPÆDIA BRITANNICA affirms that the Old Testament cannot have been completed until long after the time of Nehemiah. Its proof of this assertion seems to be threefold.

First, it cites the alleged recent dates of the books of Ecclesiastes and Daniel. But the evidence of the late writing of these books is by no means so decisive as it is the fashion in many quarters to affirm. (See ECCLESIASTES and DANIEL.) If there is sufficient evidence of the completion of the Old Testament in or near the time of Nehemiah, that evidence itself proves that these books were produced before that date.

As a second item in proof that the completion of the Old Testament is comparatively modern, the genealogies in the books of Chronicles and Nehemiah are mentioned. The most extreme instance of this sort is the name of Jaddua, the high priest, in Neh. xii. 22. This Jaddua, according to Josephus, was high priest when Alexander conquered Darius, say 333 B. C. He died at about the time of the death of Alexander (Jos. *Ant.* xi. 8, 7). How long he had been high priest is not known. Some of the traditions put it at twenty years, but it may have been for a much longer time. Now, the death of Alexander occurred B. C. 324. This was just 121 years after Nehemiah, in the twentieth year of Artaxerxes—that is, 445 B. C.—left the court of that monarch to go to Jerusalem (Neh. ii. 1). Nehemiah was then evidently a very young man. There is nothing extravagant in the idea that he may have lived for sixty-five years longer. There is nothing extravagant in the idea that the pontificate of Jaddua may have begun during Nehemiah's lifetime, and covered the remaining fifty-six years of the 121. Even, therefore, if it were necessary to assume that Jaddua's name was put into the registration after he became high priest, there would still be no absurdity in holding that the registration was made during the lifetime of Nehemiah. Much less is there any difficulty in this view when we observe that it is not necessary, or even natural, to assume that Jaddua became high priest before his name was included in the registration. Neh. xii. 22, 23 may be literally translated as follows: "The Levites, in the days of Eliashib, Joiada, Johanan, and Jaddua, were written 'heads of fathers,' as well as the priests, upon the reign of Darius the Persian: the sons of Levi, the heads of the fathers, were written upon the book of the Chronicles, even unto the days of Johanan the son of Eliashib." Three specifications are here given as to the date of this registration. First, it was made after the birth of Jaddua, for it includes his name. Secondly, it was made *upon* (not *to*) the reign—or the kingdom—of Darius the Persian. The Septuagint and Vulgate both translate, "priests in the kingdom of Darius the Persian." The thing here described is not a list of names extending to the reign of one of the kings named Darius, but a list made upon the archives of that king, or perhaps a list of the Jewish priests in his kingdom. And, thirdly, the list extends "*unto* the days of Johanan the son of Eliashib." In other words, although the list includes the name of Jaddua, it does not reach "unto the days of" Jaddua—that is, to the time of his pontificate—but only "unto the days of Johanan" his father. For some reason, Jaddua's name is entered on the list, although his father is still high priest. We may drop out of view, therefore, the question whether this man was high priest for twenty years only or for a longer time. If only he was born before the death of Nehemiah, he may have been registered in Nehemiah's lifetime. And the supposition that he was thus born does not necessitate the conclusion that either he or Nehemiah lived to a greater age than seventy-five years.

In this passage Nehemiah speaks of the pontificate of this Johanan as coincident with the reign of Darius. Josephus mentions certain incidents in it as occurring under "the other Artaxerxes." It is the fashion to assume, therefore, that Johanan became high priest during the reign of Artaxerxes II., or of his successor, Artaxerxes III., and held the office till the reign of the last Darius. This would not be necessarily inconsistent with the view of the case just presented; but a far simpler cast of the events is that which makes the pontificate of Johanan to have begun at some time during the reign of the second Darius (B. C. 423–405), and ended during that of the second Artaxerxes (B. C. 404–359).

No one can assign any reason why Jaddua should not have been registered before his accession to the pontificate. But if we can discover a plausible reason why he should have been thus registered, we shall greatly strengthen our case. And it happens that, in looking for such a reason, we find other facts which have an important bearing on the argument. As preliminary to the introducing of these facts, notice that in the passage just cited Johanan is first mentioned as the grandson of Eliashib (compare Neh. xii. 10, 11), and is immediately after called "the son of Eliashib."

It is mentioned as an important fact in Neh. xiii. 28, as that verse has been commonly translated, that one of the sons of Joiada the high priest had married the daughter of Sanballat. A strict idiomatic translation makes that verse to say, "And there was a son-in-law to Sanballat the Horonite from the sons of Joiada the son of Eliashib the high priest; and I expelled him from upon me." When we put the text in this form, and when we remember the instance just mentioned in which the grandson of Joiada's father was called the son, we have no difficulty in seeing that Sanballat's son-in-law is just as likely to have been a grandson of Joiada as a son in the stricter sense of that term.

Now, Josephus says expressly, and with considerable detail (*Ant.* xi. 7 and 8), that this young man of the family of the high priest who married a girl of the family of Sanballat was Manasseh, the brother of Jaddua. According to Josephus, there was a time when he was partner with Jaddua in the high priesthood. The elders of the Jews insisted upon it that he should either part from his wife or forfeit all sacerdotal dignities, and, after much hesitation, he chose the latter. Then his wife's relatives set in motion the train of influences which at last resulted in the establishing of the temple of Gerizim, that he might be its high priest.

Two important consequences follow from this. First, Nehemiah lived until after the marriage of Manasseh the brother of Jaddua, and is therefore likely to have been for some time the contemporary of Jaddua himself. And, secondly, if Jaddua was enrolled in the succession of high priests before he actually succeeded, and if this be regarded as a circumstance so strange as to need explanation, we have in these events a sufficient explanation of it. The official naming of Jaddua in the succession was, in effect, the official exclusion of Manasseh.

It might be objected to this that Josephus says that Sanballat was sent into Samaria by Darius "the last king" (*Ant.* xi. 7. 2), and that he therefore dates all these events so late that it is impossible to identify them with those mentioned in the book of Nehemiah. But Josephus may easily be understood to mean here, not Darius "the last king" of Persia, as Whiston assumes him to mean, but Darius the last king before the Artaxerxes whom he had just mentioned.

It is true that if we regard this account of Josephus as historically trustworthy, we must also regard him as having failed to distinguish between the Sanballat of Nehemiah, the one into whose family Manasseh married, and some later successor of his, perhaps of the same name, who was yet alive in the times of Alexander. But this is an oversight easily accounted for. With this exception, on the view just given, the accounts of Josephus and of Nehemiah fit each other, and each proves the other to be exact. It is, therefore, not a mere hypothesis, but an historical fact, that the genealogical lists in Nehemiah and Chronicles close within the limits of the lifetime of Nehemiah.

This view finds some further confirmation in the passage in 2 Mac. i. 2, 3, where it is apparently assumed that Johanan was already high priest before the close of Nehemiah's public life.

As a third item in proof of the late completion of the Old Testament we have the passages from the Mishna, which show that there were disputes among the Jews in regard to these matters up to the times of Akiba, in the first century after Christ. But respectable scholars still dispute the propriety of recognizing Daniel, the Song of Solomon, or Ecclesiastes, for example, as canonical. Indeed, many of the points about which the Jewish doctors of the first century disagreed are still in dispute. But that does not prove that these books are now of recent origin, or that they have only of late been recognized as scriptural.

At this point we need to avoid misapprehending the sense in which men are said to have "settled the canon" of either the Old Testament or the New. The history of the work of such men shows, as we might have expected beforehand, that they never determined a book to be canonical in the sense of introducing it into the canon. In every instance in which a writing is said to have been admitted to the canon the writing had already been in existence for generations, and had for generations been claimed as canonical before the discussions arose in regard to it. In every instance the decision is not that the book shall now be received to the collection of sacred writings, but that the evidence shows it to have been regarded from the first as a part of that collection. If the decisions of early scholars and councils have any validity, they are valid as proving that the books which they recognized as scriptural had always been so recognized from the time when they were written. In the case of those that were best known and most used no great difference of opinion would arise. In the case of those that were less familiar it became necessary every few generations to re-examine the evidence. This was done in the first centuries as it has been done in the last centuries. And then, as now, the decision is never that we will henceforth count such and such books as part of the Scriptures, although they were counted otherwise when they were written, but always that they have been received as scriptural from their first publication.

This is especially true of the very discussions concerning the Old Testament which are relied upon to prove the late date of some of its parts and of its completion as a whole. *Yadaim* (ch. ii.) says: "The book of Ben-Sira and all the other books written after its time are not canonical." Several similar declarations are attributed to Akiba and his companions; that is, they held that all the books which properly belonged to the Old Testament were older than our apocryphal book of Ecclesiasticus, which claims to have been written by the grandfather of a man who lived at least as early as 130 B. C. In other words, whatever their differences of opinion in regard to the contents of the Old Testament, they hold that the Old Testament had, in their day, been complete for nearly three centuries at least, and perhaps for a much longer time. Indeed, there is no reason to doubt that these very men who questioned the canonicity of Ecclesiastes and Ezekiel agreed with their contemporary, Josephus, in the opinion (*Cont. Ap.*, i. 8) that all the books which properly belonged to the Old Testament were written before the death of the prophets who were contemporaneous with the first Artaxerxes. In other words, since this Artaxerxes died 424 B. C., they may be presumed to agree with Josephus in holding that the Old-Testament canon was closed not far from 400 B. C. Their opinion that Ecclesiastes was canonical included in itself the opinion that Ecclesiastes had been in the canon from before the date to which they assigned the close of the canon itself.

A similar misapprehension is displayed in the statement that the three divisions of the Old Testament, the Law, the Prophets, and the Hagiographa, are three successive canons of the Israelitish sacred writings, the first having been completed before the second was begun, and the second being closed before the beginning of the third. It is true, in a general sense, that the first of these three divisions is earlier than the second, and the second earlier than the third. It is true that a threefold division of the Old Testament is mentioned at least as early as 130 B. C. But it is also true that the *present* threefold division cannot be regarded as having been finally settled upon until several centuries after the acceptance of the present thirty-nine books as constituting the completed Old Testament. Josephus had an entirely different threefold division. He counted the twenty-two books as including thirteen books of prophets and only four books of the third class. The order of the lists of Melito and Origen makes it apparent that if they recognized a threefold division at all, it was one more like that of Josephus than like that of the Talmuds and of our present Hebrew Bibles. It is evident, therefore, that we have here not three successive canons, made one after the other, but one canon, which was long regarded as made up of three sorts of writings, and was at length, for that reason, after it had been in existence for several centuries, divided into three definite classes. That the classification was appreciatively and correctly made is apparent to any one who will carefully examine it; but this proves the competency of the scholars who made it, instead of proving the relative antiquity of the division itself.

Moreover, Jeremiah and Ezekiel were familiar with the contents of the books of Job and Proverbs. The returning exiles, as well as several of the kings before the Exile, possessed sacred writings attributed to David and Solomon, and used these, along with the Law of Moses, in public worship. These and other similar facts prove that parts of the present Hagiographa were recognized as among the sacred writings of Israel long before some of the prophetic books were written.

In short, all these phenomena agree with the view that the Old Testament was a growth; that it was a complete collection of sacred writings at each stage of its growth; that when its growth finally ceased it was a single collection, made up of thirty-nine books, as now; and that the process of classifying these books under the letters of the Hebrew alphabet, and of grouping them into three great divisions, although it may have begun long before the closing of the collection, was yet mainly a later process.

In answer to the question when this growth began, it is now quite customary to say, With the literary prophets, Isaiah, Hosea, Amos, and their contemporaries, in the eighth century before Christ. It is admitted that there were some fragments of Israelitish literature before this, but these, it is affirmed, were not properly of the character of sacred literature. It is conceded that there was a Law, a *Torah*, but it was one which had been transmitted orally and not in writing. The prophets, it is alleged, became literary men at this period, and not before.

Assertions like these are certainly very different from those made in the Old Testament itself as it now stands. By using a concordance of proper names, one may easily see that among men who are represented as possessing the prophetic gift and as living before the eighth century B. C., literary authorship is attributed by name to Elijah, Ahijah, Shemaiah, Iddo, David, Solomon, Asaph, Nathan, Gad, Samuel, Joshua, Moses, and several others through the whole period of time back to the Exodus. And as to the oral transmission of the Law until the times of the Captivity, no one claims that there is any positive proof of anything of this kind. It is merely an inference from the alleged absence of proof that there was then a written Law. But a written Torah is distinctly mentioned even in those prophetic writings which the most radical critics assign to the eighth century before Christ (Isa. viii. 16, 20 and xxx. 8, 9; Hos. viii. 12).

But we shall cover these points more fully if we try to answer the question whether the Old Testament, as it now stands, gives a consistent and clear account of its own origin. We have a right to ask this question without any preliminary settlement of the dates and the authorship of the various books. This body of literature has existed in its present shape for at least some twenty centuries. If its shape is distorted and abnormal, we shall be apt to find evidence of this as we take its testimony on a crucial question like that concerning its own origin. If the witness does not tell the truth, he will probably, under cross-examination, contradict himself. If he gives a consistent account, then his testimony must be either accepted or disproved.

The evidence from the Pentateuch is often cited, as if its most important bearing were to show that, since Moses is claimed as the author of some matters now found in the five books, he is therefore presumptively the author of the whole. To this it is currently replied that his authorship of these parts may be held to be specified expressly to distinguish them from the other parts, which it is implied that he did not write. For the present we have very little to do with either of these inferences. Our citation of the testimony is for a different purpose—namely, to prove that the Old Testament, as it now stands, represents that there was in Israel from a very early period a growing book of the Law of Jehovah, which was kept carefully distinct from all other literature, and regarded as of divine authority and as a peculiar possession of Israel.

The two tables of stone are represented to have been in God's own writing (Ex. xxxii. 15, 16, 19; Deut. v. 22 and ix. 10; Ex. xxxi. 18, and the references below). In Ex. xxiv. 12, God is represented as saying, "That I may give to thee the tables of stone, and the Law (*hattorah*, הַתּוֹרָה), and the commandment (*hammitsvah*, הַמִּצְוָה), which I have written to give law to them." But in Deut. iv. 13, 14, Moses represents that God gave to him statutes and judgments in which to instruct the people, in addition to what God himself wrote. And in the account of the second giving of the tables it is explained that God wrote the tables, but Moses the other matters (Deut. x. 1–5; Ex. xxxiv. 1, 27, 28, 29; comp. Deut. iv. 14). What Moses wrote is here said to include the law of the festivals, etc. (Ex. xxxiv. 23–27).

The two tables of stone were deposited "in the ark" (*ba-aron*, בָּאָרוֹן), and were still there in Solomon's temple (Deut. x. 2–5; 1 Kings viii. 9; 2 Chron. v. 10). The prefix *beth* (בּ) is not elsewhere used with the name of the ark of the covenant, except in the instance of the profane looking into the ark (1 Sam. vi. 19).

In the sanctuary, before the ark (*liph'ne*, לִפְנֵי), or before Jehovah, or before the Testimony, were preserved the national memorials which were regarded as peculiarly sacred (Ex. xl. 4, 5, 23, 25; xvi. 32, 33, 34; Num. xvii. 4, 7, 10; Heb. ix. 2–5; Ex. xxv. 16, 21—*el-ha-aron*, אֶל־הָאָרוֹן).

Long before Moses received the tables, and a yet longer time before he deposited them in the ark, we find that Moses had charge of "the book," and wrote in it, by divine command, matters concerning Amalek, now apparently found in Exodus (Ex. xvii. 13, 14).

It seems to be the same book in which Moses, before he received the first two tables, wrote, "and took the book of the covenant (*diathekes*, *διαθήκης*, Sept.) and read in the ears of the people" (Ex. xxiv. 4, 7).

In Deut. xxxi. 24, 25, 26, among the arrangements made by Moses for closing up his life-work, the finished book in which the Law was written was to be deposited (*mitstsadh aron*, מִצַּד אֲרוֹן) "beside the ark of the covenant of Jehovah." The purposes to be accomplished in this appear in Deut. xxxi. 9–13; xvii. 8–11, 18–20; xxviii. 58–61.

Further notices of the contents of this book of the writings of Moses are to be found in Deut. xxx. 10; Num. xxxiii. 2; Deut. xxix. 27; xxvii. 3; Ex. xx. 5.

Josephus speaks with especial reverence of the books laid up in the temple (*Ant.* iii. 1, 7, and v. 1, 17, Joshua and the Sun). And in his *Wars*, vii. 5. 5 and 7, he mentions the Law of the Jews, along with the golden candlestick and other furniture of the Holy of Holies, as being among the spoils of Titus.

This book of the Law of Moses, whatever it may have comprised, was handed over to Joshua (Josh. i. 7–8; viii. 30–35; comp. Deut. xxvii. 1–3 and Ex. xx. 24, 25; Josh. xxiii. 6). Joshua counted it a part of his mission to add something to this book (Josh. xxiv. 25–27).

This must have been "the book" (not "*a* book") in which Samuel wrote the fundamental law of the kingdom (1 Sam. x. 25), just as Moses had written in it the fundamental law of the theocracy (Ex. xxiv. 7).

In 1 Kings ii. 3, David is said to have charged Solomon to do "as it is written in the law of Moses." In 1 Chron. xvi. 40 the arrangements for worship and sacrifice made by David are "according to all that is written in the law of the Lord which he commanded Israel." In the previous verses David's singers are represented as singing a song which cites from Genesis the story of Abraham, Isaac, and Jacob, and, apparently, that of creation (vs. 16–22, 26, 30). A longer version of this song of David is found in Ps. cxxxvi., cv., cvi., cvii. There the allusions cover the periods mentioned in Joshua, Judges, and 1 Samuel (Ps. cv. 44; cvi. 34–48). In Ps. civ. is an epitome of the account of the Creation in Genesis.

Comp. Ps. i. 2 and Deut. vi. 7; Ps. i. 6 and Gen. xviii. 19; Ps. iv. 6 and Deut. xxxiii. 19; Ps. iv. 7 and Num. vi. 25, 26; Ps. iv. 8–9 and Lev. xxvi. 5–6; Ps. xxxiii. 9 with Gen. i. 3, 6, 14, etc.; Ps. lxviii. 7 seq. with the whole story of the Exodus and the conquest; Ps. lxxvii., lxxviii., lxxxi. with the same; Ps. lxxviii. 55–72 with the books of Joshua, Judges, and Samuel. Add to all this the passages in which the Psalms praise the Torah under a great variety of names.

The evidence from the Psalms is too abundant to be here exhaustively introduced. But certainly the evidence we have examined does not lack much of proving that Solomon inherited a Bible brought up to date by David, Samuel, Nathan, and Gad, sharply distinguished by them from all other literature, and including the Mosaic writings, Joshua, Judges, Samuel, a collection of Psalms, and probably Ruth, all recognizable by the matters they contain.

According to 2 Chron. xvii. 9, the men whom Jehoshaphat appointed to instruct Judah had "the book of the law of the Lord with them." From 2 Chron. xx. 21 it appears that the songs in which one says, "Praise the Lord; for his mercy endureth for ever," were in the sacred literature of this king. One can hardly avoid comparing this with 1 Chron. xvi., and finding in it a recognition of the group of Psalms there mentioned, and therefore of the historical books recognized in those Psalms.

In the times of Hezekiah and Isaiah the same canon appears, with additions. In 2 Chron. xxix. 25, 30 we find the words of David, Asaph, Samuel, etc. mentioned as authoritative in the midst of an account of sacrifices offered according to the Mosaic laws. (See also Prov. xxv. 1.) In Isa. xxix. 18, viii. 16, 20, and xxx. 8 the terms are indefinite, and do not directly apply, but seem to show familiarity with the idea of appeal, in religious and moral matters, to a written canon of Scripture. The "book of the Lord" (Isa. xxxiv. 16) can hardly be anything else than such a canonical Bible. The prophets of the time of Isaiah are familiar, as we have seen above, with the idea of *written law* (Isa. viii. 16, 20 and xxx. 8, 9; Hos. viii. 12). They are also familiar with a definite body of instruction known as *the* Law and by other definite forms of expression (Mic. iv. 2; Isa. ii. 3 and xxx. 9 and i. 10 and v. 24; Hos. iv. 6 and viii. 1, 12; Am. ii. 4).

It is highly improbable that the copy of the Law found in Josiah's time was the only one then known. It is more natural to suppose that the excitement it caused arose from its being *the* official copy, which had been temporarily lost or concealed (2 Kings xxii. 8, 10, 11, 16, and xxiii. 2; 2 Chron. xxxiv. 14, 15, 16, 18, 19, 21, 24, 30, and xxxv. 12). Josiah's canon cannot certainly have been narrower than that of his predecessors. His written Scripture included writings by David and Solomon (2 Chron. xxxv. 4, 15). The record of his deeds includes a reference to Samuel the prophet (2 Chron. xxxv. 18), and to matters and predictions now found in 1 Kings (2 Kings xxiii. 15–18, 27).

The writers after the Captivity are perpetually referring to the "Scriptures," "the Law," "the Prophets," the writings of David, of Jeremiah, etc. (Dan. ix. 2, 6, 10, 11, 12, 13, 15, 24; x. 21; Neh. viii. 1–8; ix. 3–32; x. 29, 30; Ezra iii. 10, 11; Zech. vii. 12, etc.).

This evidence proves that the Law of Moses and certain writings of David and Solomon were accepted as authoritative from the time when they were written. It does not show absolutely that each successive portion of Scripture was kept distinct and regarded as scriptural from the time when it was written; but it does show, apparently, that this is the law of the growth of the canon of Scripture, and therefore that it is very improbable that any book has violated this law.

This does not necessitate our holding that the inspiration which produced the Old-Testament books operated by any narrow, mechanical process. On the contrary, the evidence we have examined includes many very distinct notices as to the literary processes through which the works passed. The prophetic books are not mere books of predictions, though the predictive element in them is important, but are, in the main, collections of discourses, often more or less fragmentary, with historical comments interspersed. The poetical books are similar collections of poems and maxims. The historical books are mostly compiled from older sources, and largely from older written sources. If any one fancies that each book is composed of materials miraculously revealed by God to its author, and by him for the first time written down, he is as far from the truth as possible.

The Old-Testament account of itself is not that one or more prophets of each generation of men were commissioned to write Scripture, but that, at a few times in the course of more than a thousand years, groups of men were raised up for that purpose, who used the material which had accumulated and brought the canon up to date. To the first of these groups belonged Moses, Joshua, and perhaps others (Josh. xxiv. 26 and i. 7, 8). To another group belong Samuel, David, and others. When we remember that the works cited in our present books of Chronicles are frequently capable of being identified with writings now in the Old Testament, we may not find it impossible to recognize our present two books of Samuel in the *Words of Samuel, Nathan,* and *Gad* mentioned in 1 Chron. xxix. 29. Jeremiah marks another period in the writing of historical Scripture; Ezra perhaps another; and Nehemiah apparently the last.

The view thus sketched is as far as possible from requiring one who holds it to be blind to the peculiarities of literary construction which appear in the different books of the Bible. We cannot admit, for example, that a due appreciation of these peculiarities involves "a change of view as to the authorship of the Pentateuch." The marks of compilation in parts of the Pentateuch are very distinct and evident, but that does not prove that the compiling was done later than the times of men who were contemporary with Moses. One might even hold that he was able to distinguish the work of two or more original narrators, an editor and a redactor, and might yet be of the opinion that Moses himself was both first narrator and second narrator, editor, and redactor. This would not be the most plausible theory of Mosaic authorship that could be devised, but it is not less plausible than some of the theories of the late authorship of the Pentateuch which have been gravely promulgated.

The sketch which has been thus drawn must be admitted by every one to be substantially the sketch of its own origin presented by the Old Testament as it now stands. It is confirmed by a body of external evidence which is quite voluminous and not without weight. Probably no one would claim that the view thus sketched is inconsistent with itself, or that a shred of external evidence against it can be produced.

This being the state of the argument, one might ask in surprise how men justify themselves for rejecting what thus appears to be the historical account of the origin of the Old Testament, and preferring instead accounts which they confess to be conjectural and unsatisfactory. The arguments used for this purpose are exceedingly voluminous. In this article they can only be glanced at in the most general manner. The fuller consideration of some of them belongs to that of the particular books of the Bible with which they have chiefly to do. In general, however, they mostly fall into one of four classes. Those of the first class are the most bulky. They consist in devices by which to account for the mistakes which are alleged to be present in the Old Testament as we now have it. Among these, merely conjectural emendations of the text are especially prominent. (See AHAB, DAVID.) Much of the reasoning of this sort would be valuable and pertinent if the alleged mistakes were once proved to exist, but in the absence of such proof they amount to nothing.

A second class of arguments are those from rhetorical and grammatical style to prove a late origin for something in the Old Testament which, by its own account of itself, ought to be of earlier date. But the fact that the form appears in a passage of whose early date there is some historical evidence is proof of some weight that the form itself is as early as the passage. This proof must be overbalanced by something stronger in each instance before any weight can be allowed to the instance.

The arguments of the third class are based upon the historical contents of the books. If the account above drawn from the Old Testament itself be correct, then the Pentateuchal legislation must have been in force through the times of the judges and the earlier kings of Israel and Judah. But we find only parts of that legislation actually enforced during those times. Therefore the Pentateuch cannot have been written till subsequently, and, this foundation-fact being thus overturned, we can only conjecture when the other books were written. This argument derives most of its strength from the application of a preternaturally rigid style of interpretation to the Pentateuch itself. If we may here be permitted to interpret what seem to be legal maxims as legal maxims, and not as statutes; if we may apply the rule that when the reason for a law ceases, the law itself ceases, and other similar rules,—in short, if we may interpret these books as other historical books containing laws are commonly interpreted, we shall get a very different idea of the nature of many of their requirements from that which is sometimes presented. Remembering that rules which were established for the camp in the wilderness, and rules which presuppose the existence of a united nation with a central sanctuary, cannot, in the very nature of things, have been intended to apply, without modification, to individuals for whom neither of these conditions existed, we shall find no difficulty in explaining all the facts of the history. The instances alleged to prove that the written Law did not yet exist in the middle period of Israelitish history are either mistakenly alleged or are instances in which, in the circumstances, the Law did not apply, or instances of direct disobedience.

The fourth and most influential class of arguments, from which the rest really derive their force, may be compacted into the statement that the commonly received view of the origin of the Bible is inconsistent with the philosophical doctrine of evolution. The common view represents the patriarchs, for example, as having the same religious ideas and experiences with the latest prophets; but the ideas of the latest prophets must have been more advanced than those of the patriarchs, and therefore the common account of the matter is mistaken.

When this argument is urged by men who would refer the development of the Old Testament to the agency of evolution as a substitute for that of a personal God, it is to be met, of course, with the same weapons with which the theist always defends his position against the atheist. When it is urged by others, the reply is that, admitting the fact of progressive development here, we must determine the mode of it, not *a priori*, but by induction of the facts. It is not true that one who holds substantially the traditional view in this matter must therefore deny that the Scriptures have assumed their present form by a process of growth. Such an one need not admit that he is precluded from recognizing the rise and progress of the religious ideas found in the Bible. He must insist, however, that the nature of the growth is to be learned by induction from what appear to be the facts, instead of being decided upon beforehand, and then used to test the facts. (W. J. B.)

BIBLE CHRISTIANS. The Bible Christian denomination, a branch of the Methodist family, originated in the counties of Cornwall and Devon, England, in 1815. The first society was formed in Devon, but the founder of the denomination, William O'Bryan, was a native of Cornwall, who had been a local preacher with the Wesleyan Methodists. Strongly impressed that he ought to give himself wholly to preaching the gospel, he applied for full work in the Wesleyan ministry, but was refused more than once. In 1809 he was temporarily engaged to take the circuit-work of a minister whose health had failed. That brief engagement intensified his desire. He made a "circuit" of his own and formed several classes, most of which were at first received by the Wesleyans without any objection. But as his work extended in the religiously destitute parishes around him, the Wesleyan preachers manifested a decided opposition to what they called his "irregular" way of working. He was requested to "desist," and refusing to comply with the request he was "expelled" from the Wesleyans in Nov., 1810. This was publicly done in a chapel which he had been the means of building, and the land on which it stood he had given to the connection. He continued his evangelistic work, however, and another Wesleyan minister coming to that circuit received him into the church again, together with all the societies which he had formed. The reconciliation and reunion, however, were of short duration. Mr. O'Bryan soon removed from Luxullian, his native parish, to St. Blazey, where he came in contact with the minister who had opposed him before. O'Bryan still refused to abandon his "irregular" ways, and was expelled a *second* time. He now withdrew to North Devon, and there, entering into an engagement with another Wesleyan minister to do mission-work, was very successful. When this engagement terminated the minister wanted Mr. O'Bryan to desist from preaching in these parts, but, finding twenty parishes around in which there was no dissenting preacher, he determined to proceed. He encountered much opposition, but societies rapidly increased. An attempt to effect another reunion with the Wesleyans was abortive, and O'Bryan concluded to organize those under his pastoral care into a new community. The first class was organized in 1815. The first quarterly meeting was held Jan. 1, 1816. The number of members enrolled was 237. In about eighteen months the "new cause" numbered 6 travelling preachers, 4 helpers, and 1112 members. The first conference was held at Launceston, Aug., 1819. The printed minutes contain the names of 16 men and 14 *women* itinerant preachers. From the first the denomination pronounced in favor of female preaching, though women were not put in pastoral charge of circuits or admitted to vote in conference or other business meetings. In the early days of the denomination many of these "devout women" were eminently successful in evangelistic work. But after the first decade of connectional existence the number of female preachers began to decline, and now (1883) there is not one left on the lists of the English or colonial conferences. The tenth annual conference registered 59 male and 22 female itinerant preachers, and a membership of 7845. The conference records at the end of the next decade (1828) show the itinerant preachers to be—men 84, females 11, and the membership 9839. Up to this time Mr. O'Bryan had been general superintendent, presiding at conferences and doing things generally according to his own will. But the democratic elements of the young denomination became restive, and the dissatisfaction finally culminated in a disruption at the conference of 1829. Mr. O'Bryan tried to overrule the will of the majority, declared the conference adjourned, and withdrew. A few followed and adhered to him, but the rest went on with the business of the conference. Two factions were thus formed, each claiming the precedence and right of property. This conflict continued for about two years, when a reunion was effected, and Mr. O'Bryan left for America and settled in New York. He received a liberal pension from the English conference until his death, and frequently visited his old friends both in England and in Canada. He died in New York on Jan. 8, 1868. The jubilee of the denomination was celebrated in 1865, at which time there were reported 219 itinerant preachers and 26,000 enrolled members. A jubilee volume was prepared and published in London, England, and other enterprises for the extension and consolidation of denominational interests were inaugurated—notably, the purchase of a printing-plant for the publication of denominational literature at Bowmanville, Ontario, Canada. The first missionaries were sent to Canada in 1831. The American work was organized into a separate conference in 1834. In 1882 the territory of this conference included 10 districts: 1 in Prince Edward Island, 6 in Ontario, 1 in Manitoba, and 2 in the United States—Ohio and Wisconsin. The statistics of this conference for 1882 show 81 itinerant ministers and a membership of 7531. There is another colonial conference in South Australia, having in its jurisdiction 31 ministers and 2306 members. Besides these there are districts not yet invested with conferential powers in New Zealand, Victoria, and Queensland. The last annual report of the English conference and its affiliates gives a membership of over 34,000 and 299 ministers. The denomination has one college in England, located at Shebbear, Devon. It has three publishing-houses—one in London; one in America, at Bowmanville, Ont.; and one in Adelaide, South Australia. In doctrine the Bible Christian Church adheres to the recognized standards of Methodism, and its polity is very liberal, admitting laymen as members of its conferences and all church courts. The early preachers used to carry the Bible with them, read it to the families visited, and freely quote Scripture in their sermons and exhortations. They thus acquired the popular designation of *Bible Christians*. The name is also borne by another small body in the Eastern States. (H. J. N.)

BIBLE SOCIETIES IN AMERICA. Every English Bible which America possessed before the Revolutionary War was brought from the other side of the Atlantic Ocean. John Eliot, the "Apostle to the Indians," had translated the entire Scriptures into the language of the aborigines of Massachusetts, the first portion of which was published at Cambridge, near Boston, in 1661, and the entire Bible in 1663 by Samuel Green and Marmaduke Johnson. The Testament was republished in 1680, and the Bible in 1685. Three editions of the German Bible, Luther's version, were printed by Christopher Sauer at Germantown, Pa., in 1743, 1763, and 1776. The first proposals for printing the Bible in America were issued by William Bradford of Philadelphia "the 14th of the 1st month, 1688." It was to be a large "house Bible," to be printed in "fair character, on good paper, and well bound;" "with the Apocraphy" and "useful marginall notes;" the subscription price being "twenty shillings *per Bible*," and "the Pay shall be half Silver Money and half Country Produce at Money price." These proposals were never executed. But so oppressive was the monopoly which the English Government held over the word of God that it never gave its authority to any person to publish it in the colonies. The first English Bible which appeared from an American press was published by Robert Aitken at Philadelphia in 1782, his proposals being issued in 1781, and its actual publication was somewhere between the battle of Yorktown and the peace of 1783. It was one of the first fruits of the Revolution, and bears upon its fly-leaf the following resolution, passed by the first Congress, Sept. 12, 1782, upon the petition of the publisher and the certificate of its chaplains, the Rt. Rev. William White, D. D., and the Rev. George Duffield, D. D., to whom it had been referred: "Whereupon, *Resolved*, That the United States in Congress assembled highly approve the pious and laudable undertaking of Mr. Aitken, as subservient to the interest of religion, as well as an instance of the progress of arts in this country; and being satisfied from the above report of his care and accuracy in the execution of the work, they recommend this edition of the Bible to the inhabitants of the United States, and hereby authorize him to publish this Recommendation in the manner he shall think proper." Previous to this, in 1777, upon the memorial of Dr. Patrick Allison, a Presbyterian minister of Baltimore, to the Continental Congress, then sitting in that city, a recommendation was reported by a committee of that body to import 20,000 Bibles from Holland, Scotland, or elsewhere, to supply the destitution of the Scriptures which was consequent upon the war. It is not known whether this recommendation was carried into effect. But these two facts show the place held by the Scriptures in the hearts of the people and of their representatives in that trying period. Here the action of the Government properly ceased, and the circulation of the Bible was left to the people.

See Vol. III. p. 561 Am. ed. (p. 649 Edin. ed.).

The Original Societies.—The *first* Bible society instituted in the United States was that of Philadelphia in 1808; the *second*, the Connecticut Bible Society, at Hartford, in May, 1809; the *third*, the Massachusetts Bible Society, at Boston, in July, 1809; the *fourth*, the New York Bible Society, in the city of New York, in November, 1809; the *fifth*, the New Jersey, in Princeton, in December of the same year. In 1816 there were between fifty and sixty such local societies, which worked separately, with many hindrances and no visible bond of union except the one book which they circulated.

Convention of 1816.—The necessity of a national institution was suggested at times by a few good men, of whom Samuel J. Mills, Rev. Jedediah Morse, and the statesman and philanthropist Elias Boudinot, LL.D., were the most prominent. But public sentiment on the subject did not crystallize until the convention of 1816, which met on the 8th of May in the consistory-room of the Collegiate Reformed Dutch Church in Garden Street, New York, at the call of Dr. Boudinot, the president of the Bible Society of New Jersey. In that convention thirty-five Bible societies, located in eleven States and the District of Columbia, were represented by sixty delegates, among whom were Revolutionary patriots, soldiers, and statesmen, judges, lawyers, merchants, authors, clergymen, presidents and professors of colleges and theological seminaries, the most eminent surgeon of his generation, and plain, untitled citizens. There were Presbyterians, Episcopalians, Baptists, Reformed Dutch, Congregationalists, Friends; and Dr. Morse, who was a member, says, "Roman Catholics among the rest." But "among them all there was not a dissenting voice; and so great was the Christian harmony and love that some of those least affected could not help crying out, 'This is none other than the work of God.'" The convention closed May 13, having adopted the constitution of the American Bible Society, and organized it by the election of officers, managers, and committees. A powerful address to the people of the United States, which was written by the Rev. Dr. John M. Mason, was sent out with the constitution to every part of the country. The Hon. Elias Boudinot, LL.D., who was the principal founder of the society, was elected its first president, and the society immediately began its career of usefulness. It was incorporated twenty-five years later, March 25, 1841, by the legislature of the State of New York. The British and Foreign Bible Society hailed its organization with its warmest congratulations, and added a grant of £500 in aid of its "Transatlantic fellow-laborers."

At the date of its foundation the entire population of the United States was only 8,000,000; the country was exhausted by the second war with Great Britain; west of the Alleghanies and the Ohio River there was but a sparsely-settled country, and the region beyond the Mississippi was an unbroken wilderness. Excepting the American Board of Commissioners for Foreign Missions, which was formed in 1810, there was no national or catholic Christian institution which offered a basis for union and co-operation in home and foreign evangelization. Each ecclesiastical communion stood by itself apart, and all the great benevolent Christian societies are of later date.

Constitution.—The American Bible Society is strictly an unsectarian benevolent institution. Its board of managers represents seven different denominations of Christians; it labors to circulate the Scriptures among all classes of people; and its committees, foreign agencies, district superintendencies, and auxiliaries are organized upon the same undenominational principles. The first article of its constitution declares that "the sole object of the institution is to encourage a wider circulation of the Holy Scriptures *without note or comment.*" The second provides that it "shall also, according to its ability, extend its influence to other countries, whether Christian, Mohammedan, or pagan." As a further basis of union the constitution enacts that "the only copies in the English language to be circulated by the society shall be of the version now in common use." A subscription of $3 annually constitutes a member; a payment of $30 at one time, a member for life; and of $150 at one time, a director for life. The board of managers consists of thirty-six laymen, of whom twenty-four shall reside in New York or its vicinity; and one-fourth of the whole number shall go out of office at the expiration of each year, but shall be re-eligible. "Every minister of the gospel who is a member for life of the society, if he be not entitled to receive any salary, emolument, or compensation for services from the society, shall be entitled to meet and vote with the board of managers, and be possessed of the same powers as a manager himself." Directors for life "shall be entitled to attend and speak, and, if constituted directors before June 1, 1877, shall be entitled to vote at all meetings of the board of managers." The managers, who meet monthly or oftener, appoint all officers and committees, fill vacancies, and are responsible for the entire administration of the institution, subject only to the constitutional advice and direction of the society itself. The executive officers are a president, vice-presidents, three corresponding secretaries, a general agent, a treasurer, and an assistant treasurer.

The society has had nine presidents, viz.:

Hon. Elias Boudinot, LL.D.,	elected in	...1816
Hon. John Jay,	"	...1821
Hon. Richard Varick,	"	...1828
Hon. John Cotton Smith, LL.D.,	"	...1831
Hon. Theodore Frelinghuysen, LL.D.,	"	...1846
Hon. Luther Bradish,	"	...1862
James Lenox, Esq.,	"	...1864
William H. Allen, LL.D.,	"	...1872
Hon. S. Wells Williams, LL.D.,	"	...1881

More than one hundred distinguished men have honored its roll of vice-presidents. It has had twenty corresponding secretaries, among whom were a number of the most eminent of American clergymen, while its eight treasurers, four assistant treasurers, and three general agents have administered their immense trusts with the ability and success which characterize only first-class business-men. From the date of its organization to this time about 56,000 persons have been constituted life members and life directors, of whom it is estimated that more than 40,000 are still living. Each life member may receive annually Bibles and Testaments to the value of $1, and each life director to the value of $2.50 annually. It is understood that these books shall be of the plainer and cheap kind, and especially for gratuitous distribution. The auxiliaries of the society number about 2000, and these, with their own 5000 local branches, make about 7000 Bible societies in this country which directly or indirectly centre in the national institution. The number of district superintendents in the home field at present is eighteen. To these officers are entrusted the general oversight and management of the work in their fields, the visitation and assistance of auxiliaries, the supply of the destitute places, the superintendence of colporteurs, attendance upon anniversaries, pulpit and platform presentation of the cause, collection of funds, and many other incidental and important services. Their labors are very largely of a home-missionary character, especially in the sparsely-settled regions, where the lack of the Scriptures indicates all other kinds of spiritual destitution.

The Bible House was begun in May, 1852, and occupied by the society in May, 1853. This noble edifice stands by itself on an open square bounded by Third and Fourth Avenues, Astor Place, and Ninth Street, containing about three-quarters of an acre. The building covers the entire square, with an open court in the centre, and is six stories high. It is built of brick, with freestone copings, and, without being in any way extravagant in architectural embellishment, it commands attention by its magnitude, its admirable proportions, and its chaste, neat, and appropriate finish. The entire structure is a noble monument to the liberality of those who contributed toward its erection, and is in every respect worthy of the institution the interests and growing prosperity of which it is intended to promote. Within ten years from its erection it was entirely free of debt, its cost having been defrayed by the proceeds of sale of the society's former premises, by the liberal contributions of its friends—$58,898, of which only $143 came from persons not residing in New York City—and by the subsequent proceeds of rentals of offices and stores in the building. But not one cent of the ordinary benevolent contributions of the society has ever been used in the erection or maintenance of the building. The rents of parts of it that are not needed by the society for its own purposes are more than sufficient to pay the salaries of all the executive officers, which are thus not in the least degree a tax upon the legacies of the dead or the benevolence of the living contributors to the society for its general objects.

The manufacturing department, which employs about 350 persons and is under the charge of the general agent, is carried on with all the modern appliances for stereotyping, electrotyping, printing, binding, with accurate proof-reading and careful production of Bibles, Testaments, and portions of the Scriptures in our own and other tongues. That most difficult of all foreign works, the Arabic Bible, was electrotyped and printed, and even the matrices were cut and the types made and set up, in the Bible House, under the supervision of the reviser, the Rev. Dr. Van Dyck, and his assistants. The society own over 120 sets of stereotype and electrotype plates, comprising over 60,000 pages of Scripture, which include twenty-two sizes of English Bibles and sixteen of the New Testament, which are bound in all requisite popular styles, from the largest and costliest to the plainest and smallest.

The prices of the society's books are by its constitution fixed "at cost;" and "cost" is regulated by certain rules which the managers have long acted upon in the light of their large experience and with the benevolent intention of the institution. In accordance with these views, the Bibles and Testaments published by the society are sold uniformly for cash, without discount, at the list (or cost) price to all purchasers, with the exception that to auxiliary societies and dealers in books a discount of 10 per cent. is made. And in order to avoid all charges of speculation in the society's books the auxiliaries are earnestly requested to carry out the benevolent design of the parent society by selling books at first cost when they are able, and in no case to add more than the cost of transportation and depository expenses. It should be stated, however, that for the sake of promoting the circulation of the Scriptures among those who are least able to pay for them, several of the society's publications in plain bindings, like the agate New Testament, the nonpareil Bible, and the German 12mo Bible, are entered on the list at prices which are much below the actual cost. The society has never been a rival nor an antagonist to the book-trade, but by keeping to its own line of benevolent work it has been of advantage to other publishing-houses by increasing the demand for the Scriptures, not only in its own editions, but also in more costly forms and with accessories, such as notes and comments, which are precluded by its own constitution.

Issues and Receipts.—The growth of the society's work of publication, and the increase of its receipts, are shown in the following table, which gives the number of copies issued in each tenth year, the number issued in the decade ending with that year, and the corresponding receipts:

Year.	Copies issued— in year.	Copies issued— in decade.	Receipts— in year.	Receipts— in decade.
1817...	6,410	....	$37,779.35	
1826...	67,134	439,580	53,639.85	$449,532.73
1836...	221,694	1,549,848	101,771.48	954,897.94
1846...	483,873	2,510,156	196,182.48	1,233,039.95
1856...	668,265	6,772,338	393,167.25	3,042,632.44
1866...	1,150,528	10,513,654	642,635.64	4,754,850.65
1876...	850,470	11,340,190	527,108.27	6,794,188.60

The issues of the last six years (1877 to 1882) were 7,281,815. The total number of volumes issued by the society from its beginning to the close of the fiscal year, March 31, 1882 (sixty-six years), was 40,407,584. These totals, however, do not include many hundreds of thousands of its issues and purchases, and copies printed for other societies in foreign lands, which were not statistically reported until within a few years past. The issues of the last decade exceed those of the first forty years. The entire receipts from all sources from the organization to March 31, 1882, have been $20,449,001.12.

The benevolent character of the institution has always been carefully developed. The expenses of its general administration are fully met by the proceeds of rents derived from the Bible House. The manufacturing department is simply self-sustaining, and is neither a source of profit nor dependent upon the charitable funds. Benevolence finds its appropriate field in the translation, revision, publication, and distribution of the Scriptures, and in other legitimate methods of operation, such as the maintenance of the society's home and foreign agencies, colportage, and the diffusion of its reports and other printed information respecting its work. The value of its grants of books for distribution in the United States within the decade from April, 1872, to April, 1882, was $737,510.55, and the cash sent to foreign lands was $935,913.39. In return, the receipts from sales of books from these grants in the United States were $225,205.51, and from sales in foreign lands $163,222.47. Within the same period the number of families reported as visited in this country was 5,206,383, of whom 723,114 were found destitute of the Scriptures, and of these 481,320 were supplied, in addition to 255,716 individuals not included in those families. These figures represent only in part the increasing benevolent work of the society, its sources of income, its outgoes of Scriptures, its obedience to the great law of demand and supply, and its endeavors to accomplish its mission and fulfil its trusts.

Contrasts.—Some of its most beneficent results can only be summarized by a paragraph of contrasts. At the date of the formation of the British and Foreign Bible Society (1804), and of the American Bible Society (1816), the cheapest English Bible in this country cost about two dollars, even in the poorest type and binding. Now it is the cheapest book in the world. The whole Bible can be had for twenty-five cents, and the New Testament for five cents. Before the era of Bible societies the whole number of Bibles in the world is estimated to have been about 4,000,000 in all lands and languages. Now the number of editions is past reckoning, and there are more copies of it in the English language than in all other human tongues combined. Bible societies alone have published over 170,000,000 volumes, of which the American Bible Society has issued 40,407,584. When the American Bible Society began its work there was no provision for furnishing the Scriptures to newly-arrived immigrants; now it is a ceaseless and increasing work, the distribution at the single port of New York in the year ending March 31, 1882, reaching 101,095 copies in fifteen languages. Then few school-children in America possessed copies of the Scriptures as their own; now the demand upon the society for cheap and good school Bibles and Testaments for reading, study, and rewards is constant and immense, both for secular and Sunday-school uses. In 1816 not a sentence of Holy Writ had been printed for the blind. The New Testament, in four quarto volumes, was first published in raised letters through the zealous efforts of the late Dr. Samuel G. Howe of Boston, mostly by the united contributions of the Massachusetts and the New York Female Bible Societies, which were supplemented by the American Bible Society. The Psalms were issued by the parent society in 1839, and the entire Bible, in eight and in sixteen volumes folio, was published in 1845. The issues of this work in 1881 were 507 volumes, and the total number issued for the blind in forty years was 12,856. The society has also published portions of the Word in raised letters for the sightless readers of Syria and Egypt and others of the races speaking the Arabic language, and within the last year the Gospel of St. Luke in Japanese.

The military and naval Bible-work of this society has always been important in peace, but in war-time it has been conducted with great energy, cost, and success. Its agents followed the armies of the Union into Mexico, and distributed the Scriptures freely to Mexicans and Spaniards, as well as to American soldiers. Some of these Bibles and the results of that work have lately come to light. It united with the British and Foreign Bible Society in supplying English, French, Sardinian, German, Italian, Polish, and Russian soldiers and sailors in the Crimean War. During the Civil War in this country every army and fleet, camp and hospital, that could be reached was supplied. At one period nine Testaments per minute for every hour of daily working-time were produced at the Bible House. In the first year nearly 700,000 volumes were distributed to the army and navy. The United States Christian Commission, through its agents and 5000 delegates, distributed

1,466,748 volumes, valued at $179,824.90, all of which were donations, in trust, for this service. At least 3,000,000 volumes were gratuitously distributed among the contending forces, of which not less than 500,000 volumes were given to Confederate soldiers within their own lines and to those who were prisoners of war.

Immediately after the war the society resumed its work in the South, and within one year reoccupied all but three of the once confederated States, and the next year these also were within its field. The great work among the freedmen, which began with the first refugees —or "contrabands," as they were then called—and extended to the colored troops, soon spread over all the Southern States. The supply of these poor folk was made a strict condition of the restoration of the society's work by its agents and auxiliaries and in all grants of the Scriptures to missionary, educational, and other benevolent associations and church organizations.

General Supply.—Three general efforts to supply the whole country with the Scriptures have been made by this society, which were begun in the years 1829, 1856, 1866: the latter, being its jubilee memorial thank-offering to God at the close of its fiftieth year, was the most extensive, prolonged, and costly. It continued three years, and was as thorough as the condition of the country so soon after the war, and the ability of the institution and its agencies, permitted. From the inception of this work in 1866, to March 31, 1876, a period of ten years, the results reported are represented by the following figures:

Number of families visited	5,454,788
Number of families found without the Scriptures	541,569
Number of destitute families supplied	376,257
Individuals supplied in addition	299,871
Sabbath and other schools supplied	14,507

A fourth general re-supply of the United States and Territories was ordered by the board of managers in May, 1882, which will probably occupy several years, and will be carried forward with all of the society's resources and agencies for production and distribution, and the aid of pastors, missionaries, and co-operating societies, and especially by its new system of colportage, by which it expects to reach personally the most sparsely-settled, distant, and destitute places. The magnitude of this work is to be measured by the extent and variety of the population, now numbering nearly 53,000,000, living in 38 States and 9 Territories, with the District of Columbia, and by the fact that the biblical destitution ranges from 1 in 9 to 1 in 5 of the families of the land. Of 714,636 families visited in 1881, 111,932 were without the Scriptures, and of these 81,995 were supplied, besides 46,430 individuals additional.

The foreign work of the society began with its own beginning, the first efforts of the managers being directed "to the translation of the Scriptures into the Indian languages of our country, the publication of the Spanish New Testament, and of the Scriptures in French." The British and Foreign Bible Society generously donated the stereotype plates of the French Bible, thus commencing the happy co-operation of the two institutions in giving the Bible to the world. In 1804 the Bible was found in only fifty ancient and modern languages, some of the former being dead, and many of the translations were poor. Since then new translations have been made into 226 languages and dialects, the number of versions being 268 or more. The American Bible Society has promoted the translation and circulation in whole or in part of versions in 83 languages and dialects, of which 58 are new versions. These include translations and revisions in the tongues of the most populous unevangelized countries, such as China, Japan, the Turkish empire, Arabia, Persia, Egypt. The Bible is now printed in the languages of 800,000,000 of the human race. While this great work has been achieved chiefly by the missionaries, it is safe to add that without the help of Bible societies there is little probability that the work could have been so well and so fully accomplished.

At New York the society has printed the entire Bible in English, French, Spanish, Portuguese, Welsh, German, Danish, Swedish, Arabic, modern Armenian, Reval Esthonian, Zulu, and Hawaiian; also the New Testament in Italian, Slavonic, Bulgarian, ancient Syriac, and modern Syriac; also for the aborigines of North America the Dakota Bible, the Cherokee and Choctaw New Testaments, with considerable portions of the Old Testament, the Ojibwa New Testament, besides smaller portions in Seneca, Delaware, Muskokee, Mohawk, and Nez Percés. Versions of parts of the Bible have also been printed in Arrawack and Creolese for South America; in Benga, Mpongwe, Dikele, and Grebo for Africa; in the dialects of Kusaie, Ponape, Ebon, Mortlock, and Gilbert Islands, and in Japanese. Its foreign operations include also the circulation of various copies manufactured abroad, among which may be mentioned the Bridgman and Culbertson, and the Mandarin, Canton, Fuhchau, Ningpo, Amoy, and Shanghai colloquials in China; the Hebrew-Spanish, Turkish, Armeno-Turkish, Græco-Turkish, Azerbijan, ancient and modern Armenian, Persian, and Koordish in the Levant; the Hindi, Urdu, and various other languages in India and Ceylon; the Siamese, Mongolian, and Japanese. The entire New Testament in Japanese was completed in 1880; the Old Testament is in progress, and also a version of one of the Gospels in the colloquial.

In the prosecution of this work the society employs its own agencies in Brazil. China, Japan, Mexico, Persia, Russia, Turkey and the Levant, and Uruguay, and last year employed 214 colporteurs in those lands. It appropriates annually ample grants of funds for Bible-work to the various missionary boards and societies operating in Europe, Asia, Africa, Micronesia, Central and South America, and the Sandwich Islands, to the Bible Society of France, the Waldensian and Free Italian churches, etc. Within the last fiscal year 56,000,000 pages of Scriptures were printed at the expense of the society—10,000,000 in China, 20,000,000 in the Levant, and 26,000,000 in Japan. The expenditures for foreign work in the last sixteen years have been $1.400,806.11, as against $1,932,685.79 for grants in the home field within the same time

Translations and Revisions.—The board makes annual appropriations to missionary societies that request aid for defraying the cost of translations and revisions, and will pay in whole or in part for the support of translators engaged in this work, and also for the services of native scribes and helpers. Reports are to be regularly rendered of the progress of the work, and the version when completed becomes the property of the American Bible Society. The principles upon which this aid will be given are clearly stated in the following regulations respecting appropriations: "5. In the matter of Scriptures in foreign languages the board will favor versions in any language which in point of fidelity and catholicity shall be conformed to the principles upon which the American Bible Society was originally founded. 6. No translation shall be printed and published with the funds of the American Bible Society until a committee of missionaries, or others skilled in the language, shall have given it their approbation, except in cases where no such committee of revision can be procured." Only versions that have this quality of catholicity, and can be read and preached from and circulated by Christian missionaries of all branches of the Church of Christ, can be published or circulated by the American Bible Society under the constitution and regulations to which its whole history is a pledge.

The society's unique and valuable *biblical library*, the commencement of which was made in 1817, contains about 3500 volumes. It consists chiefly of editions of the Holy Scriptures in more than 150 languages and dialects. It has a considerable number of versions and revisions in English of earlier and later date than the version in common use. The various editions published at the expense of the society in foreign lands are well represented. The library contains an ancient Hebrew roll from China and some specimens of early typography; Latin Bibles of 1476 and 1480; Gerbelius's Greek Testament of 1521; the first edition of the Syriac New Testament, 1555; Tischendorf's *Codex Sinaiticus;* the first and second editions of King James's Bible; the first editions of the Rhemish Testament and the Douay Bible; and many other volumes hardly less interesting.

The Revised New Testament.—It only remains to state that until the constitution of the society shall be changed so as to permit the circulation by it of other copies in the English language than those of "the version now in common use," it can have nothing to do with the Revised New Testament of 1880. The immense sales of that book, amounting to nearly 3,000,000 copies in the first year of its publication, have produced no marked effect upon the sales of the Common Version at the society's depository. Nor is it likely that the constitution will be altered until the revision of the Old Testament shall be finished and the work shall have been so approved by its popular acceptance as to justify its recognition and adoption as the standard English Bible.

OTHER BIBLE SOCIETIES IN AMERICA.

The Bible Association of Friends in America was organized in 1828. While its object has been "to encourage a wider circulation, as well as a more frequent and serious perusal of the Holy Scriptures," its attention was first directed to furnishing the Bible to poor members of the religious Society of Friends. Its office has always been in Philadelphia, and it has printed and distributed reference Bibles as well as Bibles and Testaments. For many years auxiliary associations in neighborhoods where Friends reside assisted in the distribution of the books, but as these districts have been supplied, less has been done in this way. Down to 1874 it had circulated 154,431 volumes; in the decade ending in 1878 it distributed 59,709 volumes; and in 1882 it distributed 3471 volumes. Some of these were given to colored freedmen, and others to Indians who were under the oversight of Friends. In 1882 the receipts of the society from all sources were $5407.

The American and Foreign Bible Society was formed in the city of New York May 12, 1836, but took larger dimensions in a convention held at Philadelphia in April, 1837. This movement grew out of the dissatisfaction of many Baptists with the principles and practice of the American Bible Society as embodied in the following resolution, which was adopted Feb. 17, 1836, after a protracted discussion: "*Resolved*, That in appropriating money for translating, printing, or distributing the Sacred Scriptures in foreign languages, the managers feel at liberty to encourage only such versions as conform, in the principle of their translation, to the common English Version, at least so far as that all the religious denominations represented in this society can consistently use and circulate said versions in their several schools and communities." The "single object" of the American and Foreign Bible Society was declared in its original constitution to be "to promote a wider circulation of the Holy Scriptures in the most faithful versions that can be procured." The history of the movement shows that the chief occasion of separation from the American Bible Society was its constitutional inability and unwillingness to sanction any versions in which the word *baptizo* and its cognates should be translated by "immerse," "immersion," etc. The new society resolved, and always acted upon the resolution, which was adopted in April, 1838, "That in the distribution of the Scriptures in the English language they (the board) will use the commonly received version until otherwise ordered by the society." But in consequence of their persistent determination, which was reaffirmed in resolutions of May, 1850, not to attempt on their own part or to procure from others a revision of the commonly received English Version of the Sacred Scriptures, another separation took place within its own ranks, and

The American Bible Union was organized in New York, June 10, 1850, under a constitution whose second article says, "its object shall be to procure and circulate the most faithful versions of the Sacred Scriptures in all languages throughout the world." Its cardinal rule of translation was this: "The exact meaning of the inspired text, as that text expressed it to those who understood the original Scriptures at the time they were first written, must be translated by corresponding words and phrases, so far as they can be found in the vernacular tongue of those for whom the version is designed, with the least possible obscurity or indefiniteness." In pursuance of this principle the book of Job was published in 1856; the New Testament complete in 1865; Genesis in 1868; the Psalms in 1869; Proverbs in 1871; Joshua, Judges, and Ruth in 1878; at which date Isaiah was partly stereotyped and the books of Samuel, Kings, and Chronicles were ready in manuscript, but were withheld for lack of funds. The society was then heavily in debt, and has since been dissolved. It had collected a valuable biblical library and spent about $250,000 upon its revision of the English Bible. In foreign languages it prepared the New Testament in Italian, Spanish, Chinese, written and colloquial, Siamese, Sgau-Karen, and had translations in MSS. of the Gospels in Maya, Matthew and Acts in Chinese colloquial for Shanghai, and the entire Bible in the Pwo-Karen language. In this work of translation the Union has had the services of a large number of biblical scholars of its own and other denominations. The total number of copies of the Scriptures circulated by this society from 1850 to 1866 was 603,184, and the circulation of the American and Foreign Bible Society from 1837 to 1875 was 2,250,583.

Both of these societies having practically failed of the object for which they were formed, a third effort is in progress (1883) to organize a new movement in the interests of the Baptists for a larger and more permanent and successful Bible-work. (W. J. R. T.)

See Vol. III. p. 563 Am. ed. (p. 651 Edin. ed.).

BIBLIOGRAPHY. In 1876 bibliography received a great impetus from the publication by the United States Government, through its Bureau of Education, of a *Special Report on Libraries*, which appeared almost simultaneously with a conference of American librarians at Philadelphia and the establishment in New York of the *American Library Journal*, now the *Library Journal.* Though these occurrences belong rather to the subject of libraries than to that of bibliography, they deserve mention here, as the relations of bibliotheca1 to bibliographical science are so close that the latter has received almost as much profit from them as the former. The Philadelphia conference resulted in the formation of an American Library Association, which was followed by a similar organization in Great Britain, the Library Association of the United Kingdom; and in the proceedings of both of these associations the questions of indexing, cataloguing, and classification, which form the basis of all bibliographical science, have been among the most prominent topics discussed. These conference discussions have been supplemented by a great variety of contributions in the *Library Journal*, and were preceded by a very full treatment of the same subjects in the *Special Report.* An intimate acquaintance with these publications is therefore indispensable to any one seeking to study the present condition of bibliography.

For current information as to bibliographical publications Petzholdt's *Neuer Anzeiger* (Dresden) is the most comprehensive, though for English and American users the department of "Bibliografy" in the *Library Journal* gives all that is really important. The latest general catalogues of bibliographies are Power's *Handybook about Books* (London, 1870), Rye's *Books of Reference in the Reading Room of the British Museum*

(London, 1871), Sabin's *Bibliography of Bibliography* (N. Y., 1877), Brunet's *Manuel du Librairie, Supplément* (Paris, 2 vols., 1878–80), Gee's *Works relating to Bibliography, History of Printing*, etc. (Oxford, 1880), Porter's *Hand-list of Bibliographies, etc., in the Reading Room of the British Museum* (London, 1881), and Leypoldt's *Bibliographical Aids*, contained in the second volume of his *American Catalogue* (N. Y., 1881). Of these Brunet continues to be *the* authority. Porter's book supersedes Rye's, and Sabin's is virtually an enlargement of Power's. Leypoldt's list excludes the earlier works, giving only the comparatively recent, and by its compactness, topical arrangement, and plentiful use of notes forms the most practical and useful one yet issued. Most of the book-producing countries have trade journals giving lists of the new books (not bibliographical) as they appear, as the *Publishers' Weekly* (N. Y.), *Publishers' Circular* and *Bookseller* (London), *Bibliographie de la France* and *Polybiblion* (Paris), *Allgemeine Bibliographie* (Leipzig), etc.; and a number also issue annual lists of each year's publications. An important trade feature in the United States is the binding together yearly of the catalogues of the leading publishers, the volume forming the *Publishers' Trade-list Annual*—an idea which has been adopted in England and Italy, although its publication in those countries is less frequent than in the United States. There has been no attempt at a universal catalogue, though the practicability of compiling one has been often discussed. The nearest approaches to it—and they are far removed —are the catalogues of large libraries and the catalogues of books published in various countries. Unfortunately, the largest libraries have no printed catalogues, though the British Museum has at last begun printing one of its collection, which, when completed, will undoubtedly be the most extensive in the world. The Advocates' Library (Edinburgh) issued (1867–79), in six large quarto volumes, an author-catalogue of the contents of that library; the Library of Congress (Washington) issued a subject-catalogue in 1869, and is now printing an author-catalogue; the Boston Public Library has a series of class-lists; the Boston Athenæum has lately published a "dictionary" catalogue in five octavo volumes; and the Brooklyn (N. Y.) Library has recently issued a combined classed and "dictionary" catalogue. Of the catalogues of books published in different countries may be mentioned Leypoldt's *American Catalogue*, covering the books in the market up to 1876, with a partial supplement to 1880; Low's series of *Indexes to the English Catalogue*, brought down to 1881; Lorenz's *Catalogue générale de la Librairie Française*, 1840 to 1875; Heinsius's *Allgemeines Bücher-Lexikon*, from 1700, etc. These are all author-lists, with the exception of the *American Catalogue*, which is by authors, titles, and subjects, or on the "dictionary" plan.

While the idea of a universal bibliography has been about abandoned, the number of select lists and of lists on special subjects has rapidly increased. The former range in size from courses of reading, in which but comparatively few titles are interspersed with hints on the right use of books, to large classified lists which aim to give all titles of any importance. Porter's *Books and Reading* (N. Y., 1881) and Putnam's *Best Reading* (N. Y., 1876, 1882) are examples of these. Lists on special subjects range between still wider limits, and are far more numerous than the select lists. Dr. Billings' *Index-Catalogue of the Library of the Surgeon-General's Office* (Washington) is virtually a medical bibliography, which, when completed, will cover 10,000 closely-printed large octavo pages. From this they graduate in size to such specialties as tobacco, insurance, butterflies, and crayfish. There have been a number of national and local bibliographies, and of bibliographies devoted to separate events in history and to noted individuals. Important scientific works have frequently appended to them bibliographies of the subjects treated, a practice now extending to works not scientific. Similar lists are often given in periodicals and in the bulletins of the leading libraries. This multiplication of special lists may be said to be the leading characteristic of the present decade, and has been forced upon specialists by the marvellously rapid increase of books in all departments of knowledge. The value of some of these lists is much enhanced by the insertion of descriptive notes giving the limitations of the books, mode of treatment, and other features. The newly-organized London Index Society has undertaken the compilation and publication of indexes to transactions of learned societies, state papers, important individual works of reference which have no indexes, etc., which private enterprise would not undertake through fear of insufficient returns. It includes in its work annual indexes to the obituary notices which appear in the leading English and American periodicals, and in this it is assisted by a number of American bibliographers. A still more important indexing enterprise is a new edition of Poole's *Index to Periodical Literature*, of which the first edition appeared in 1848 and the second in 1853. The edition now in press (Boston) will be five or six times the size of its predecessor, and will contain analytical references to the contents of nearly two hundred English and American journals from their establishment to 1882. The compilation has been made by the co-operation of a number of librarians under the general editorial direction of Mr. Poole and Mr. W. I. Fletcher. More minute indexes have lately been made to the annual volumes of magazines and to some of the leading newspapers, and some of these have also published indexes to their complete series. Nearly all important works intended for reference are now accompanied by carefully made indexes.

There has been but little recent discussion abroad on the subject of classification, and in America the discussion has regarded shelf-arrangement and numbering in libraries rather than classified catalogues, the general sentiment remaining in favor of the unclassified "dictionary" system. In the *Special Report* of the U. S. Government, systems of classification and cataloguing were explained with great fulness, and accompanying that report was a set of cataloguing rules by Mr. Cutter, which have become the authority on the subject, superseding those of Prof. Jewett. A set of more condensed rules was subsequently drawn up by the American Library Association, and the United Kingdom Association has still more lately adopted similar rules for the guidance of English bibliographers. Mr. Dui has devised a system of decimal classification, with mnemonic features for shelf and catalogue use, and this system (with modifications) is now under trial in a number of libraries. Schemes of classification have also been published by Mr. F. B. Perkins and by Mr. L. P. Smith, but their appearance is too recent as yet to test their general utility. Other plans and suggestions have frequently appeared in the *Library Journal*. The Brooklyn Library catalogue illustrates an alphabetico-classed system, and the catalogue of the N. Y. Apprentices' Library is an example of still another style. The American Library Association attempted in 1878 to get rid of the present confusion in designating book-sizes (resulting from the various sizes of paper used) by using the actual page measurement instead of the fold of the sheet, and by indicating the size by letters instead of numbers; but the system has not yet been sufficiently generally adopted to ensure its permanency.

The most important contribution yet made to pseudonymy is Halkett and Laing's *Dictionary of the Anonymous and Pseudonymous Literature of Great Britain*, of which the first volume has just appeared (London and Boston, 1882). In 1875, M. Franklin published in Paris a *Dictionnaire des Noms, Surnoms et Pseudonymes Latins de l'Histoire Littéraire du Moyen Age, 1100 à 1530*; and in 1880, Mr. Ralph Thomas ("Olphar Hamst") issued his *Aggravating Ladies: a List of Works published under the Pseudonym of "A Lady"* (London). In addition to these there have appeared a new edition of Barbier and some minor lists.

On the subject of printing comparatively little has been published lately. De Vinne's *Invention of Printing* (Hartford, 1876) is perhaps the leading work. Besides this there have appeared a second edition of Thomas's *History of Printing in America* (Albany, 1874), Brunet's *Recherches sur les Imprimeries Imaginaires, Clandestines et Particulières* (Brussels, 1879), and the first volume of Bigmore and Wyman's *Bibliography of Printing* (1880), as well as a number of local and smaller books.

New editions of the *Index Librorum Prohibitorum* appeared in 1877 and 1881 (Rome), and in 1879 Drujon published an enlarged edition of his *Catalogue des Ouvrages Condamnés* (Paris, 1814–77). A heliographic reprint of the *Catalogus Librorum Officinæ Elzevirianæ* was issued in Paris in 1880, and in the same year, at Brussels, A. Willems published *Les Elzevier, Histoire et Annales Typographiques.* On rare and curious books two bibliographies have recently appeared—Lacroix's *Recherches Bibliographiques sur des Livres Rares et Curieux* (Paris, 1880), and a second edition of Brunet's *Livres Perdus* (Brussels, 1882).

Among the miscellaneous works treating of various other phases of bibliography are Egger's *Histoire du Livre depuis ses Origines jusqu' à nos Jours* (Paris, 1880), Uzanne's *Caprices d'un Bibliophile* (Paris, 1878), Derôme's *Le Luxe des Livres* (Paris, 1878), Brunet's *La Bibliomanie en 1878, en 1880* (Paris, 1878, 1880), Warren's *Guide to the Study of Book-plates* (London, 1880), Lang's *The Library* (London, 1881), Langford's *Praise of Books*, and *Connaissances Nécessaires à un Bibliophile* (Paris, 1877).

These are but a few of the many books that have appeared touching every phase of the subject. It is noticeable that in America but scant attention has been paid to the antiquarian side of the science, the main thought of bibliographers being directed to facilitating the use of books, and not to recording their history For this reason they have constructed their catalogues, as a rule, so that they may be consulted the most readily by the ordinary reader, rather than for the specialist.

Of the names prominent in American bibliography those of Spofford, Winsor, Cutter, and Noyes are the most prominent after Cogswell's and Jewett's. (L. E. J.)

BIBLIOMANIA (Greek, *βιβλίον*, a book, and *μανία*, madness), an enthusiastic and absorbing desire to collect books—not to read them and profit by the knowledge they contain, but to satisfy the sense of possession, with a certainty that few if any others possess them also. The word is of modern introduction, like the other words of a similar construction—*bibliograph*, *bibliophile*, and *bibliopole.* Bibliomania first appeared in Holland, for a long time the centre of elegant bookmaking, at the close of the sixteenth century, but the word was brought into use by the Rev. Dr. Thomas F. Dibdin, who wrote a work entitled *Bibliomania* in 1809, which Douce says adds another illustration to the *moriæ encomium*, or praise of folly. Bibliomania is a disease which readily attacks a bibliophile, or book-lover, just as the money-lover is in danger of becoming a miser. Bibliomaniacs spend their lives and large sums of money in the purchase of rare books, with the certainty, if they give the matter a thought, that they will be scattered again at the last. After the introduction of printing it required a long time to produce the material for making men bibliomaniacs. It is not instruction or the facility of obtaining it that such men want, for in modern reprints of older works they may procure these at much less price and in clearer form. What is sought instead of utility is rarity and curious taste in date, subject, treatment, quality and tint of paper or vellum, curiousness of type, the name and period of the printer, the style of binding, and, more than all, the smallness of numbers. Books are also valuable in this view on account of the distinguished persons to whom they have belonged, manuscript annotations, autographs, etc. In comparison, exact facsimiles are of very small value.

For rarity and great price the Mazarine Bible is perhaps the most notable book, being the first complete book ever printed with movable metal type. Its name is due to the fact that a copy on vellum was discovered by De Bure in the library of Cardinal Mazarine, and identified as the work of John Gutenberg, the inventor of printing. It was described by De Bure in his *Bibliographie Instructive* (Paris, 1763–68). It has no printed date, name or place of printer, no pagination or signatures. An approximation to the date is furnished by a valuable certificate afterwards found at the end of the second volume of another copy now in the National Library of Paris: "*Iste liber illuminatus ligatus et completus est per Henricum Cremer, vicarium collegat. s. Stephani Maguntí, sub anno dñi 1456 festo assumptionis gloriosae virg. Mariae. Deo gracius. Allelnia.*" We thus ascertain that the printing was completed in or before 1456, probably in 1455, though some mark the date 1450–55. As other copies, both on paper and on vellum, were brought to light and compared, further acquaintance with its history was obtained. Henry Stevens describes the copy belonging to Earl Spencer as having 641 leaves, printed in double columns, 42 lines to a full column, with initials and rubrics in manuscript throughout. In a later form, to which all the vellum and most of the paper copies belong, there are only 40 lines on each of the first eight pages, 41 on the ninth, while the rest have 42; further, the three lines in red at the beginning are in type, and not filled in by hand as in the earlier copies. These variations show that Gutenberg himself issued the copies with uniform pages of 42 lines, while the others were issued by Fust after the lawsuit in 1456 by which he came into possession of Gutenberg's whole stock and types. The leaves at the beginning had been damaged in the transfer, and had to be replaced. The smaller number of lines is due to the use of abbreviations, for which new types seem to have been cast by Schöffer. There is another edition, sometimes ascribed to Gutenberg, but now considered to be a subsequent issue by Fust and Schöffer. It is called the "Bamberg Bible," because nearly all the known copies of this edition were found in the vicinity of Bamberg, but it is also called with greater precision the "Bible of 36 lines."

There are now known of the Mazarine Bible seven copies on vellum and twenty-two on paper, two of which are in New York. Those on vellum are distributed as follows: 1, in the National Library, Paris (the Mazarine copy); 2, Royal Library, Berlin; 3, British Museum (Grenville copy, sold at Gaignat's sale, 1769, for 2100 francs; at the MacCarthy sale to Grenville for 6260 francs); 4, earl of Ashburnham's library (with two leaves supplied by manuscript; sold at Nicols's sale, 1825, to Henry Perkins for £504; at Perkins's sale, 1873, to the earl of Ashburnham for £3400); 5, Leipzig Library; 6, Henry Klemm's library, Villa Augusta, Dresden (bought by Klemm in 1881 from Albert Cohn of Berlin); 7, Dresden Library (a fragment only). The paper copies are distributed as follows: 1, National Library, Paris; 2, library of Mazarine College, Paris; 3, Imperial Library, Vienna; 4, Public Library, Trèves; 5, Bodleian Library, Oxford; 6, Advocates' Library, Edinburgh; 7, George III.'s library, British Museum; 8, duke of Sussex's library (sold at Perry's sale, 1822, for £168; Sussex sale, 1844, for £190; at archbishop of Cashel's sale, 1858, for £596); 9, duke of Devonshire's library; 10, Earl Spencer's library; 11, Lenox Library, New York (sold at Hibbert's sale, 1829, to Wilkes for £215; bought for Mr. Lenox in 1848 for £500); 12, John Fuller's library; 13, Lloyd's library (bought at the Larches sale for 2121 francs); 14, Leipzig Library; 15, Munich Library; 16, Frankfort Library; 17, Hanover Library; 18, emperor of Russia's library (a duplicate from the Munich Library, sold to the emperor in 1858 for 2336 florins); 19, library at Mentz; 20, Henry Huth's library, London (bought at Sir M. M. Sykes's sale in 1824 for Henry Perkins for £199 10s.; at Perkins's sale, 1873, bought by Bernard Quaritch for £2690, and sold by him in 1878 to Mr. Huth for £3000); 21, Hamilton Cole's library, New York (17 leaves supplied; bought at the sale of the Brinley library, April 7, 1881, for $8000; it came from the Archiv of the Prediger-Kirche of Erfurt, and is described in the *Serapeum*, Leipzig, Aug. 15 and 31, 1870); 22, a copy of the Mazarine Old Testament, discovered about 1876 in Bavaria, and purchased by G. Kamensky; afterwards bought by Bernard Quaritch, the London bookseller, for £760, and offered by him in his catalogue, 1880, for £880. A perfect copy of the Mazarine Bible on paper, in good order, is worth about £3000; a copy on vellum, about £4000.

To English collectors the copies of William Caxton's handiwork are of inestimable value, because he brought the art into England in 1474; next to these are the volumes printed by Wynkyn de Worde, Caxton's foreman and successor. The Elzevirs, or Elzeviers, were a family of printers and publishers in Amsterdam who lived between 1583 and 1680, and were distinguished for their very excellent editions of Virgil, Terence, and other Latin poets, and are said to have employed women as type-setters, because they could be better trusted not to make alterations in the text. These editions are in great demand. Thus also copies of the Aldine editions are greatly esteemed; they owe their name to the family of the Manuti, who were renowned printers in Italy during parts of the fifteenth and sixteenth centuries. Of these the first was Aldus, whose issues were characterized by learning and great typographical correctness, and are the most valued. This family printed the ancient classics and the works of Dante, Boccaccio, and Petrarch. Of later publishers, Foulis in Glasgow, Baskerville in Birmingham, Pickering in London, Fick in Geneva, and Didot in Paris, are among those whose work is most esteemed.

The competition among collectors was fully illustrated at the sale of the library of the duke of Roxburghe in 1812. This nobleman had been collecting his library for forty years, and it numbered more than ten thousand titles, including many rare books. The sale gathered the principal book-fanciers, and was of the nature of a severe contest for forty-two successive days, excluding Sundays. The rarest book was the Valdarfer Boccaccio, the first edition with date, printed at Venice in 1471. It was in excellent condition, the yellow morocco binding being only a little faded. It had been originally purchased for 100 guineas, but such was the competition it reached the highest price which had ever been paid for a single book, £2260, although when sold again in 1819 it only brought £918. The enthusiasm excited by this sale caused the establishment of the Roxburghe Club, which led to the formation of the Bannatyne, Maitland, and others.

See Vol. III. p. 575 Am. ed. (p. 665 Edin. ed.).

BICYCLE (from Lat. *bis*, twice, and Gr. *κύκλος*, a circle or wheel), a name given to a skeleton vehicle consisting primarily of two wheels and a perch, and having the following features of construction: Both wheels are suspension wheels; the forward one, of much larger diameter than the rear one, has an axle of considerable length fixed to rotate with it, and so set and mounted as to constitute it at once the driving, guiding, and substantially the supporting wheel of the vehicle. The small wheel, following immediately behind, has its bearings in the lower forked ends of a perch. This perch has a step to mount by, and a saddle with a spring for the rider. It extends upward in a curved line close to and over the large fore wheel. The bearings for the axle of this fore wheel are in a fork, which, extending upward on both sides of it, terminates in a head, which contains a swivel or socket joint for the reception of the upper end of the perch, and has a cross-bar or handles parallel with the axle below, and somewhat longer than this latter, for the guidance of the wheel. The fore axle is provided with cranks, oppositely projecting from its outer ends, at right angles with it, and which bear on their pins loose pedals for the rider's feet. The rider has his position a little behind a vertical line passing through the axis of the fore wheel, and therefore almost directly above the same. It will therefore be seen that the machine is really one wheel, with some adjuncts to make it operative. Hence the familiar name, "the wheel," given to the bicycle.

The bicycle is merely the outgrowth of the velocipede, which has a hundred years of history, while the former in its present form is only about a dozen years old. *Le Journal de Paris* of July 27, 1779, describes a cumbersome contrivance constructed by Blanchard and Magurier, which was to be propelled by the rider, and drew to their exhibition of it in the square made famous later on as the Place de la Concorde many members of the French Academy and other distinguished spectators. Since that time the velocipede, under various names, has undergone modifications and improvements in almost every direction. Whether called mechanical carriage, perambulator, accelerator, mechanical horse, or cantering propeller, it is a distinct species of the genus "vehicle," and is well defined as a kind of carriage impelled by the rider. The bicycle, though covered by this definition, is yet different and distinct from the velocipede both in structure and in principle of operation. The first occurrence of the name "bicycle" is found in the English patent records in the provisional specifications of J. S. Stassen, filed April 8, 1869. The rudimentary bicycle, or the first step in its divergence from the original form, was made by the Baron von Drais of Mannheim, who used his device as an aid to walking while about his official duties as chief forester to the grand duke of Baden. It was named after the inventor "the draisine," and consisted of two wheels, one before the other, connected by a bar or perch over them, the forward wheel axled in a fork swivelled to the fore end of the perch, and bearing a cross-bar or handles above the latter to direct it. The rider sat astride the perch, propelled the contrivance on level or up grade by thrusting his feet on the ground, and directed it by means of the handles by turning the direction of the fore wheel; while on a descending grade he lifted his feet from the ground and let it run. This draisine, or, as the inventor called it célérifére (or "make-speed"), was exhibited in Paris in 1816.

Another form, introduced in England in 1818, was "Johnson's pedestrian curricle," having an adjustable saddle, a cushioned rest for the fore arms, and a different arrangement of the handles. It was very favorably received in England, and acquired the names of "dandy-horse" and "hobby-horse." It was brought to New York in 1819, where it created a *furore* which proved infectious, and it made its appearance shortly afterwards in Troy, Boston, Philadelphia, and other cities. The next progressive step in the improvement of the novel machine was made in England in 1821 by Louis Gompertz. His improvement consisted chiefly in connecting the handle in front of the driver with a segment rack gearing into a pinion on the front wheel, so that it could be driven by the hands as well as by the feet on the ground. Little improvement was made in the machine, and it soon fell into disuse, until, about forty years later, a French mechanic, Pierre Lallement, revived the interest by making some essential changes. Taking off one of the rear wheels of the common velocipede, he moved the remaining one up to the middle of the axle, into line with the fore wheel, and rode it like the ordinary draisine. This two-wheeled velocipede, which soon acquired the name "bone-shaker," was exhibited by Lallement's employer, M. Michaux, at the Paris Exhibition in 1865. In the following year Lallement came to the United States, and excited some attention by riding on a two-wheeled velocipede in the level streets of New Haven, Conn. He had never applied for a patent in France, but Mr. Carrol of Connecticut quickly saw the opportunity, and in 1869 a joint patent was granted to Lallement and Carrol. This patent shows the two-wheeled velocipede with foot-cranks, and was certainly a great improvement upon the draisine, but was still a clumsy affair, lacking important features to make it either a practical road vehicle or a bicycle.

The title of Lallement to be regarded as the first to have taken the initiative step towards the construction of the bicycle is disputed. An Englishman, Edward Gilman, filed provisional specifications in the British patent-office in 1866 for a two-wheeled, crank-action velocipede. It differed from Lallement's velocipede in this, that the rear wheel was made the driving-wheel and the front wheel the guiding-wheel, and that the rider was placed as near as possible over the axle of the driving-wheel. It is to be observed that Gilman approached nearer to the bicycle in this latter respect, and also in respect to driving by weight of rider rather than by muscular effort only; while Lallement made a nearer approach in making the front wheel at the same time the guiding and the driving one. In July, 1868, the Hanlon Brothers took out a U. S. patent for a two-wheeled velocipede, which for a short time excited a sensation in this country, but soon proved its worthlessness as a road vehicle.

The first bicycle proper was introduced in 1869 to the public of England, where the development of the machine was more steady and successful. From the years 1867 to 1869 a great many English patents were taken out, showing a steady progress in perfecting its construction. In 1868, Mr. Rivière of Mark Lane, Middlesex, placed on record a description of his machine, in which the forward wheel "was somewhat larger than the back one," thus pointing the way in the direction which led the English first of all toward the bicycle. In the latter part of the same year C. K. Bradford of the United States gave them the suggestion of a rubber tire, the first American contribution, and an important one. Finally, Edward A. Cowper, an Englishman, put in the suspension wheel and anti-friction bearings, and so supplied the last remaining necessary element in the construction of the bicycle. From that time the patented improvements have been numerous, and the mechanical details of construction have been thoroughly worked out, resulting in the present almost perfect machine.

It was not until the latter part of 1877 that interest in the modern bicycle was awakened in the United States. The firm of Cunningham, Heath & Co. (now "The Cunningham Company") of Boston, Mass., then commenced to import into the United States the best makes of the English bicycles. The pioneer paper devoted to the new interest was started in the same year —*The American Bicycling Journal*, edited by F. W. Weston, the present treasurer of the Cunningham Company. The following year Mr. A. A. Pope of Boston started the Pope Manufacturing Company, thus establishing the first bicycle manufactory in the United States. The interest in the machine has since steadily increased, and promises a natural and healthy development in this new American industry.

The bicycle differs from the two-wheeled velocipede not only in general appearance, but also in general organic features. Its fore wheel is twice as large, and its hind wheel half as large, as in the latter. The wheel is constructed on the suspension principle, and is of steel instead of wood; the tire is of round rubber instead of flat iron or steel. The shape, while more graceful, is such that the rider propels it mostly by a part or the whole of his weight, instead of only by muscular thrust; takes upon it the natural position of walking, and so strains no part of his body; maintains his equilibrium in a different and easier manner, and obtains greater speed or rises a steeper grade with less effort. It has a larger base on the ground, and when mounted its centre of gravity is below its centre of magnitude, instead of above it, and so is much more in stable equilibrium. It is only half as heavy. Although seemingly a very simple contrivance, yet the simplest of modern bicycles require 150 separate pieces of metal for their construction, while the most elaborate contain 300 pieces or even more.

The weight of these machines varies with the purpose for which they are intended, *roadsters* weighing from 40 to 60 pounds, and *racers* from 20 to 35 pounds. The diameter of the front wheel ranges from 40 to 60 inches, the wheel being chosen to fit the rider.

(A. F. H.)

BIDA, Alexandre, a French artist, was born at Toulouse in 1813. He studied art in Paris under Eugène Delacroix. In 1844 he went to the East, where he remained for two years, and on his return to Paris exhibited a large number of drawings of Oriental and scriptural subjects, such as Le Chanteur Grec, Café Arabe, Boutique Turque, Le Marche d'Esclaves, Le Barbier Arménien, and La Bastonnade. His Rétour de la Mecque was purchased by the Government, and his Cérémonie du Dosseh au Caire by the duc de Morny. To the Salon of 1861 he contributed several drawings, and to the Exhibition of 1867 Le Mur de Salomon. Among the most noted of his compositions are Le Grande Condé à Rocroy, Le Champ de Booz à Bethlehem (purchased by the Government), Massacre des Mamelukes, Le Départ de l'Enfant prodigue, and Décollation de Saint Jean Baptiste. He has also painted a number of portraits, including that of his patron the duc de Morny, and has contributed a large number of drawings to the serial publication entitled *Le Tour du Monde.* Bida's *magnum opus*, however, is the series of designs in illustration of the Evangelists, and published by Hachette et Cie in 1873 in two folio volumes. These designs were reproduced by the most celebrated etchers of the day, and the volumes are probably the most magnificent specimens of book-making of the century. Bida has also contributed designs to a handsome ten-volume edition of the writings of Alfred de Musset (1866), and has illustrated *The History of Ruth* (1876) and *The History of Joseph* (1878). He has received several medals, and in 1870 was decorated with the cross of the Legion of Honor. Bida is a learned and skilful draughtsman and a graceful designer, and his compositions, when treating of subjects within the range of his powers, are pleasing. He is a literalist, however, and his designs illustrative of the Evangelists are seldom more than approximately successful, except in the delineation of scenes and incidents which do not imperatively call for imaginative treatment. His best illustrations of biblical and modern Oriental subjects give the impression of being quite accurate transcripts of realities, but, although the different themes are, for the most part, treated with intelligence and dignity, the real interest of the composition is apt to attach to matters of secondary importance. (W. J. C., JR.)

BIDDEFORD, a city of York co., Maine, is on the right bank of Saco River, opposite the town of Saco, 5 miles from the Atlantic Ocean, and 15 miles S. W. of Portland, on the Boston and Maine Railroad, and on the Portsmouth, Saco, and Portland Railroad. It has two hotels, a bank, one daily and three weekly newspapers, six churches, and ten schools. The river Saco is here crossed by four bridges, and has a fall of 42 feet, affording abundant water-power for several large saw-mills, a furniture-factory, and a woollen-mill. Biddeford was settled in 1742. Its property is now valued at $676,800, and its debt is only nominal. Its public expenses for 1881 were $6000. Population, 12,651.

BIDDLE James (1783–1848), an American naval officer, was born at Philadelphia, Feb. 29, 1783. He was educated at the University of Pennsylvania, and entered the navy as midshipman in February, 1800. During the war with Tripoli he was captured in the frigate Philadelphia, and held in confinement nineteen months. In the War of 1812 he sailed as first lieutenant of the Wasp, and led the boarders in the action with the Frolic. The latter being taken he was assigned to its command, but soon after both vessels were captured by the British ship Poictiers and carried to the Bermudas. After his exchange in March, 1813, he was placed in command of a flotilla of gunboats on the Delaware, and thence was transferred to the Hornet, one of Decatur's squadron, then blockaded at New London, Conn. Making his escape after some months, he captured the Penguin on March 23, 1813, off the island of Tristan d'Acunha. For this achievement Congress voted him a gold medal and other honors, and in February, 1815, he was made a captain. While commanding the Mediterranean squadron in 1831 he negotiated a commercial treaty with the Turkish Government. In 1845 he was engaged in diplomatic service in China. He died at Philadelphia, Oct. 1, 1848.

BIDDLE, Nicholas (1750–1778), an American naval officer, was born at Philadelphia, Sept. 10, 1750. In 1770 he entered the British navy, but soon absconded, and, having shipped as a seaman, served under

Nelson, then an officer on the Carcass, in the exploring expedition of Capt. Phipps, afterward Lord Mulgrave. When he returned to Philadelphia after the commencement of the War of Independence he was made captain of the brig Andrew Doria, with 14 guns and 130 men. He took part in Com. Hopkins's attack on New Providence; then cruised off the banks of Newfoundland and captured several prizes, including two transports from Scotland which were bringing 400 Highland troops to America. In February, 1777, he was appointed to the command of the Randolph, a 32-gun frigate, and soon carried into Charleston four valuable prizes. He was then made commander of a small squadron, and cruised in the West Indies. In March, 1778, he encountered the Yarmouth, a British 64-gun ship, and in the action which ensued he was wounded. A few minutes later the magazine of his vessel exploded, and with almost his entire crew he was blown up. Out of 315 men, only 4 survived.

BIDDLE, Nicholas, LL.D. (1786–1844), an American financier, was born in Philadelphia, Jan. 8, 1786. He was the son of Charles Biddle (1745–1821), who was vice-president of Pennsylvania, and a nephew of Com. Nicholas Biddle. He graduated at Princeton College, and in 1804 went to Paris as secretary of legation under Gen. John Armstrong. He afterwards held a similar position under Monroe at London. Returning to Philadelphia in 1807, he commenced the practice of law and also engaged in literary labor. He assisted in editing the *Portfolio*, compiled a *Commercial Digest*, and prepared the narrative of Lewis and Clarke's expedition. He was a member of the State legislature in 1810–11, and endeavored to establish a general system of education. In 1814, being a member of the State senate, he supported the war with England. In 1819, Pres. Monroe appointed him a Government director of the United States Bank, and in 1823 he was made its president. This position he held during the attacks on that institution by Pres. Jackson, and when the charter of the bank expired in 1836 he was made president of the United States Bank of Pennsylvania, which was then organized. In 1839 he resigned this position, and when the bank failed two years later he published a vindication of his management of its affairs. When payment of interest on the debt of Pennsylvania was suspended for a brief period he published some suggestions for its liquidation, which were in part adopted by the legislature. He was a zealous promoter of public improvements, and exercised great influence on public affairs by his literary ability as well as his business talent. He died at Philadelphia, Feb. 27, 1844.

BIERSTADT, Albert, an American landscape-painter of German birth, was born at Düsseldorf in 1828. About two years later his parents removed to the United States, and took up their residence in New Bedford, Mass. Having early shown a talent for drawing, Bierstadt returned to Düsseldorf in 1853 for the purpose of study. He subsequently visited Italy, and made several trips through the Alps and other mountainous regions, and returned to the United States in 1857 with a considerable number of paintings and studies. The picture which attracted the greatest amount of public attention was entitled Sunshine and Shadow. This picture, which as a careful and intelligent transcript of a picturesque bit of nature has never been surpassed by any subsequent production of the artist, was used by him as an exhibition-piece for a long time, and attained a great popularity. Bierstadt's interest in mountain-scenery had its origin in his visits to the Alpine and Apennine regions of Europe; and when Gen. F. W. Lander's Rocky Mountain expedition was fitting out in 1858 he made arrangements to accompany it. On his return to the East he brought with him a great number of studies and sketches, and set to work industriously to paint ambitious pictures designed to represent the characteristic features of the region visited. His first important Rocky Mountain picture, Lander's Peak, was exhibited in 1863, and made considerable sensation. This was followed by others in the same vein, and in 1873 the artist added to his store of materials by a visit to the Pacific coast. Bierstadt has painted many representations of Rocky Mountain and Sierra Nevada scenery, of which the most important as regards size, if not the most meritorious, are a A Storm in the Rocky Mountains, Domes of the Yo Semite, Laramie Peak, Looking Down the Yo Semite, and Mount Hood. In 1869 he revisited Europe, and was the recipient of many social and professional attentions, both in England and on the Continent. In 1871 he was made a member of the Academy of Fine Arts of St. Petersburg. Bierstadt enjoyed the advantage of being the first to attempt the delineation of Rocky Mountain scenery, and the fact that he was a sort of pioneer is his chief claim to distinction. His execution has the vices of the Düsseldorf school in being coarse and in seeking to astonish rather than to delight. Not only do his pictures show no appreciation whatever of the finer charms of nature, but the best of them are marred by bad drawing, by a lack of any adequate understanding of atmospheric phenomena, and by other glaring faults. Their merits are topographical and scenic rather than genuinely artistic. Bierstadt, however, is very unequal, and is at his worst in his largest and most ambitious pictures. Some of his smaller canvases have considerable merit of a very genuine sort.

(W. J. C., JR.)

BIENVILLE, Jean Baptiste le Moyne, Sieur de (1680–1768), French governor of Louisiana, was born at Montreal, Canada, Feb. 23, 1680. He was the third of eleven sons of Charles le Moyne, baron of Longueuil, whose family was eminent in Canadian affairs. He served under his eldest brother, Iberville, in several voyages, and was severely wounded in a naval action in which the French ship Pelican, of 42 guns, defeated three English men-of-war. In 1698, Iberville was commissioned by the French Government to explore the mouth of the Mississippi and erect a fort near it. The first settlement was made at Biloxi, Dec. 7, 1699, and in January, 1700, Bienville, having explored the country around, erected a fort 54 miles above the mouth of the river. In the following year, on the death of his brother, Sauvolle, he succeeded to the direction of the colony, and transferred its capital to Mobile. He was afterwards accused of misconduct, and in 1707 was dismissed from office. But the governor appointed to succeed him died on the voyage from France, and Bienville retained the position till 1713, when Lamotte Cadillac was sent out as governor, and Bienville was made lieutenant-governor After Law's Mississippi Company was formed a new colony was sent out, and Bienville, being appointed governor, founded the city of New Orleans in March, 1718. In May he took Pensacola from the Spaniards, and placed his brother, Châteauguay, in command. In 1723 he transferred the seat of government to New Orleans, but in January, 1724. he was recalled to France, and was removed from office Aug. 9, 1726. Before leaving Louisiana he had published a code which remained in force until after Louisiana was purchased by the United States. By the code Jews were banished from the colony, the Roman Catholic religion alone was tolerated, and the condition of slaves was regulated. In 1733, Bienville was restored to the governorship with the rank of lieutenant-general. He was again removed from office, and in May, 1743, he returned to France, where he died in 1768.

BIGAMY. By the common law of England a second marriage contracted during the existence of a first was absolutely null and void, and by the statute of 1 James I. c. 11, it was enacted that "if any person, being married, do marry again, it is felony." The principle of the common law, making void a second marriage as above stated, is part of the unwritten law of the United States, and in many States has been incorporated into the body of the statute law. In every State and Territory (Utah and Indian Territories alone excepted) and in the United States laws similar in principle to, and based upon, the statute of James I. have been enacted, making indictable the crime of bigamy, or, more properly speaking, polygamy. The judiciary has also declared in many instances that polygamy is incompatible with the civilization and social condition of the United States. In one case the Federal courts held as worthless the defence that polygamy was a religious privilege sanctioned by local usage. In another case the application for citizenship made by two polygamists was refused, the court intimating that the applicants, by reason of their belief and practice, were not "men of good moral character, attached to the principles of the Constitution of the United States, and well disposed to the good order and happiness of the same." By the statute of James I. there were certain excepted cases recited wherein the second marriage of one who at the time had a former husband or wife living was not felonious, although perhaps void. These excepted cases were—(1) where either party to the first marriage has been for seven years previous to the second marriage continuously absent from the kingdom; (2) where there had been a like absence within the kingdom, the remaining party not having had knowledge of the other's being alive within that time; (3) where there had been a divorce or separation by sentence in the ecclesiastical courts; (4) where the first marriage had been declared void by any such sentence; (5) where either of the parties was under the age of consent at the time of the first marriage. In all the States and Territories wherein bigamy is an indictable offence the foregoing exceptions have, either wholly or in part, been adopted. In several of the States another exception has been made of the case where either of the parties to the first marriage has been sentenced to imprisonment for life. The majority of the States have reduced the term of absence required by the first and second exceptions to five years; in New Hampshire, Florida, and Iowa the term is three years; and in Pennsylvania, while there still exists the common-law presumption of death after an absence of seven years, and no tidings of the absentee within that time, yet the statute making penal the offence of bigamy provides that "if any husband or wife, upon any false rumor, in appearance well founded, of the death of the other (when such other has been absent for two whole years), hath married or shall marry again, he or she shall not be liable to the penalty" therein imposed. The language of the third exception in the statute of James I. has been changed in most of the States to mean a divorce, either judicial or legislative, from the bonds of matrimony. The fifth exception is sometimes qualified in statutory law by the proviso that the marriage contracted within the age of consent shall not have been ratified when the parties were capable of contracting.

The *gravamen* of the offence of bigamy under the statute of James I. was the contracting of the second marriage. The statute of limitations began to run from the day of marriage, and the venue was laid and trial had in the county where the marriage took place. Unless changed by statute, the law in this respect in the different States is similar to the construction placed upon the statute of James I. The courts have in several cases so held, and in Arkansas a statute declaring that an indictment for bigamy might be found against a person in any county in which he might be apprehended was held unconstitutional under a provision in the constitution of the State giving to one accused of any crime the right to trial by a jury of the county in which the offence was committed. In many of the States, however, the crime of bigamy has been extended so as to embrace subsequent cohabitation in the State, although the bigamous marriage has been contracted elsewhere. The statute of limitations in such case begins to run from the period of last cohabitation; the crime is a continuing one; and the venue may be laid in any county in which cohabitation takes place. In Maine, New York, and Kansas, as well as in Arkansas, statutes have been passed authorizing the indicting and trying of the bigamist in any county in which he may be apprehended. In Delaware there is a provision as follows: "If any inhabitant of the State shall go out of this State and contract a marriage contrary to this section" (the section defining and punishing the crime of bigamy), "with intention to return and reside in this State, and shall return accordingly," he or she shall be liable to be indicted, tried, and punished in the same manner as if the marriage had been solemnized within the State. In Maine, Delaware, and Mississippi the definition of polygamy in the criminal code is extended so as to embrace the case of an unmarried person knowingly marrying the husband or wife of another, when such husband or wife is thereby guilty of polygamy. In many of the other States an unmarried person so marrying may be indicted and punished, but in the States above mentioned the offence is plainly denominated bigamy or polygamy. In almost all the States the crime is graded as a felony; in New Jersey it is a high misdemeanor; while in Pennsylvania and a few other States it is a simple misdemeanor. The nature and extent of the punishment vary in different States. In some there is simple imprisonment in the penitentiary; in others, imprisonment in the penitentiary or county jail; in others, imprisonment and fine Every State has imprisonment of some kind. The fines that may be imposed reach a maximum of $2000 in Delaware, and the term of imprisonment ranges from a minimum in Delaware and Indiana of three months in the county jail to a maximum of twenty-one years in the penitentiary in Tennessee. In Maryland, if the offender be a man, his first wife, upon his conviction, is endowed as tenant in dower of one-third of his real estate and entitled to one-third of his personal estate, and the offender forfeits his claim as tenant by the curtesy or any claim to personal property that he might have in right of his first wife. If the offender be a woman, she forfeits her dower and her distributive share of her first husband's personal estate. The Kentucky statute contains a provision similar in principle. The statutory limitation to the prosecution for bigamy varies from one year after the offence has become known to the public prosecutor, as in Louisiana, to six years from the commission of the offence, as in Maine and other States. In a few of the States there is no statutory limitation.

The second marriage being void at common law, it followed as a natural consequence that the issue was illegitimate. This rule is still in force in most of the States of the Union. In Louisiana, however, by statutory enactment, the husband or wife *de facto* of the second marriage, who has acted in good faith, and the issue of such marriage, are placed on an equal footing respecting the succession to the estate of the offender with the lawful husband or wife and the issue of the first marriage. In Georgia the issue of the second marriage, born before the commencement of any prosecution for polygamy or within the ordinary time of gestation thereafter, is legitimate. In Texas the issue of marriages deemed null and void is nevertheless legitimate. In Georgia and in several other States the proviso excepting from the penal statute second marriages contracted after the judicial dissolution of the first is qualified by the further proviso that the person contracting the second marriage shall not be the one whose improper criminal conduct was the cause of the divorce in the first.

Upon the trial for bigamy a valid first marriage must be proved, and after that a second marriage. The nature of the proof required is intimately connected with the marriage laws of the different States, and a discussion of it will come within the scope of the article upon MARRIAGE. (P. B.)

BIGELOW, ERASTUS BRIGHAM, LL.D. (1814–1879), was born April 2, 1814, at West Boylston, Worcester co., Mass. His father was a farmer, a man of small means, and his early advantages for education were limited. He developed great inventive genius as early as when fourteen years old, receiving quite a sum for an automatic machine entirely of his own invention. Subsequently he went to Boston and became a clerk in a dry-goods store, but the bent of his mind was in another direction. His first important invention was a power-loom for weaving knotted counterpanes. Following this came a power-loom for weaving coach-lace, which was the means of his immediate success in the next and most important of his inventions, and that by which he is most widely known—the carpet power-loom. Previous to this invention plain fabrics with simple designs were the only products of the power-loom. But under the more than forty patents taken out by Mr. Bigelow almost all the complex designs and textures which have been wrought by the hand-loom may now be woven by the rapidly-moving machinery of the power-loom. On the basis of his inventions, in connection with his elder and only brother, Horatio Nelson Bigelow, in 1837, at Clinton, then a part of Lancaster, Mass., Mr. Bigelow began the organization of his various industries, resulting in the formation of the Clinton Company for the manufacture of coach-lace, the Wire-cloth Company for the manufacture of wire-cloth, the Lancaster Mills for the manufacture of ginghams, and the Bigelow Carpet Company for the manufacture of Brussels and Wilton carpets. All these have been and are still successful in their original locality, with the exception of the coach-lace works, now in Philadelphia.

Mr. Bigelow was a man of exceptional ability in many other directions than as an inventor. He was pre-eminently successful as a manufacturer, as shown by the excellence of all the products of the mills with which he was connected, with the working details of which he was entirely familiar, and which were under his personal supervision and control. In financial ability he was not less marked, as the great pecuniary success of all his industries demonstrated, in all of which he was the guiding spirit. As a writer, especially in the department of political economy, Mr. Bigelow rendered important service. He was a protectionist, and so able in the presentation of his views that his writings are known to have widely influenced tariff legislation at home and abroad. His principal published work was *The Tariff Question considered in regard to the Policy of England and the Interest of the United States* (1862). As the first president, and until his death an executive director, of the National Association of Wool-Manufacturers, he showed a high order of creative and executive ability. His policy in control of that body, and in the union with it of the wool-growers of the country, has secured for it a national influence, and for the two united industries perfected and stable legislation productive of great good to both. He was one of the incorporators of the Massachusetts Institute of Technology, and a member of several societies for the promotion of the arts and sciences. In 1867 he received the honorary degree of LL.D. from Amherst College. He died in Boston, Dec. 6, 1879.

BIGELOW, Jacob, LL.D. (1787–1879), an American physician, was born at Sudbury, Mass., Feb. 27, 1787. He graduated at Harvard College in 1806. He took great interest in botany, and in 1814 published the *Florula Bostoniensis* and in 1820 *American Medical Botany* (3 vols). He was for twenty years a physician of the Massachusetts General Hospital, and for forty years professor of materia medica and of clinical medicine in Harvard College. He also, as Rumford professor (1816–27), delivered lectures on the application of science to the useful arts, which were collected and published under the title *Elements of Technology* (1829); this work was subsequently enlarged and published as *The Useful Arts* (1840). In 1820 he was one of a committee of five appointed to form the "American Pharmacopœia." He was the founder of Mount Auburn Cemetery near Boston, the first of its kind in the United States. He died at Boston, January, 1879. His essay on *Self-limited Diseases* (1835) had much effect on medical practice. Among his other publications are—*Nature in Disease* (1854); *Rational Medicine* (1858); *History of Mount Auburn* (1860); *Modern Inquiries, Classical, Professional, and Miscellaneous* (1870).

BIGELOW, John, an American author and journalist, was born at Malden, Ulster co., N. Y., Nov. 25, 1817. He graduated at Union College in 1835, and was admitted to the bar in New York City in 1839. At this period he interested himself in literature and journalism. He edited several important works and gathered materials for others, and in 1850 became part proprietor of the *New York Evening Post* with Wm. Cullen Bryant. He was subsequently appointed United States consul at Paris, and in 1865 succeeded Mr. Dayton as minister at the French court. In 1869 he edited the *New York Times*, and subsequently went abroad. He has since acted as secretary of state of New York, and made additional contributions to literature. His works include *Jamaica in 1850; Life of Fremont* (1856); *Les États-Unis d'Amérique en 1863* (Paris); *Molinos the Quietist* (1882); *Some Recollections of the late Antoine Pierre Berryer* (1869). He edited the autobiography of Franklin from original manuscripts and materials collected in France, and has written numerous articles on political and other subjects.

BIG RAPIDS, the county-seat of Mecosta co., Mich., is on the Muskegon River, 56 miles N. of Grand Rapids, and on the Grand Rapids and Indiana Railroad, and is connected with Muskegon by a branch road. It has two banks (one national), two public halls, Holly water-works, a public library, three weekly newspapers, eight churches, a fine brick school, a hospital (Roman Catholic), three large saw-mills, five planing-mills, furniture-factory, three foundries, machine-shops, saw-works, several carriage-factories, tannery, flour-mills, etc. It carries on extensive trade in lumber, and the river, having two dams, furnishes abundant water-power. Big Rapids was first settled in 1856; incorporated as a city in 1869. Population, 3552.

BILL OF RIGHTS may be defined as a formal declaration by the supreme authority of a state of certain rights which it asserts to be fundamental and inalienable, and which it declares shall not be violated in any way by the various agencies entrusted with the administration of governmental affairs. In England the *Petition of Rights* is a term applied to a famous bill passed by Parliament and presented to Charles I. for his assent in 1628. The Parliament called in that year, in view of the many and gross recent violations of the rights of the subjects by the Crown, passed this declaratory statute, setting forth certain fundamental rights which it asserted to be the birthrights of English subjects. This bill or petition by no means received the cordial support of the Lords, who proposed amendments favoring the claims of the Crown, but were finally compelled to yield to the Commons. The king was extremely reluctant to consent to the bill, and endeavored at first to escape the necessity by promising verbally to avoid in the future the abuses against which it was directed. He at length sent back a vague answer which in effect yielded none of the points involved. The two houses then addressed him for a more specific answer, and the king gave his consent in the usual form. After the Convention Parliament had declared the throne forfeited by James II. and vacant, they passed, as a part of the same act by which they called William III. to the throne, a *Declaration of Rights*, which was formally presented to him when he landed in England. Shortly afterwards the principles of this declaration were re-enunciated in a formal act of Parliament, and this act constitutes what is properly known as the Bill of Rights in England. The bill specially declared against the power claimed by the Crown to suspend or dispense with laws, against its levying money under any pretence without authority of Parliament, and against the keeping of a standing army in time of peace; and it asserted the right of petition and the right of Protestant subjects to carry arms suitable to their condition; and further declared in favor of frequent Parliaments, that the freedom of debate therein should not be questioned, and that the election of members should be free; that excessive bail ought not to be required, nor excessive fines nor cruel nor unusual punishments inflicted; and that jurors should be duly impanelled and returned, and in cases of high treason should be freeholders. The bill did, in fact, contain little but an assertion of those rights which certainly had belonged to the subject, but had been frequently violated in later years. Assertions of these rights are to be found in many charters and public acts since Magna Charta. The Act of Settlement (12 & 13 Will. III. c. 2), which fixed the right to the crown of Great Britain in the present house, also contained a similar assertion of rights which were claimed to be the subject's undoubted privileges.

In America, the earnest devotion which the colonists had to liberty led to the passage of bills of rights almost as soon as formal systems of government were adopted. These declared in general in favor of those rights of personal liberty and security which lie at the base of all free systems of government, and were hence similar in principle to the like declarations in England. It is also curious that many of even the earliest declarations of the colonists were expressly aimed against any claim of a right in any one but themselves or their representatives to impose a tax upon them, and the Revolutionary history shows how strenuously this principle was later adhered to. Shortly after the passage of the Stamp Act, Patrick Henry introduced into the Virginia house of burgesses his famous resolutions, containing a very bold and explicit declaration of the rights of the colonists. They were passed after some changes, and asserted that the colonists were entitled to all the rights of natural-born subjects of Great Britain, and that among these rights one of the most characteristic was the right of taxation by themselves or by the vote of representatives elected by themselves. This right, they asserted, had been frequently exercised, and never given up. The Massachusetts Resolves of 1765, written by Samuel Adams, were passed soon after Virginia had thus declared herself, and were to the same general effect. Widely circulated as they were among people who were greatly stirred by the events of the time, they excited the deepest interest among those who favored the colonists, and were characterized by the royalists, on the other hand, as "the ravings of a parcel of wild enthusiasts." The convention of delegates from nine colonies which assembled at Albany in 1765 again declared these natural rights, and gave them the new force arising from the approval of a body representing so large a portion of the colonies. And they were again declared and strengthened by the passage of similar resolutions by the first Continental Congress, which met in Philadelphia in September, 1774, and in which all the colonies were then represented except Georgia. This memorable document asserted that the colonists were, by the laws of nature and by the English constitution and their own charters, entitled to the rights of life, liberty, and property, which they had never given up to any one, and that their ancestors had brought with them, and had still possessed in the colonies, all the rights of natural-born subjects; that the right to participate in the legislative power lay at the foundation of English liberty; and that, as that right could only be secured to the colonists in their provincial legislatures, the latter alone could legislate for the colonies in matters of taxation and of internal policy: it further asserted their right to the common law of England, so far as they had found it applicable to their condition, and especially claimed the privilege of trial by a jury of the vicinage. The authorship of this paper is not known; it has been attributed to more than one person, but there seems to be reason for believing that it proceeded, in part at least, from the pen of Samuel Adams. This declaration especially, and the others already noticed, form the groundwork of most of the subsequent bills of rights which have been passed by the States and incorporated into their fundamental law. Not a little of the Declaration of Independence also may have been derived from the same source. They have been the gradual growth of centuries among the Anglo-Saxon races, and the literature and thoughts of other peoples also were borrowed from to bring them down to clear expression; the influence of French thought and expression can be clearly seen pervading them. To characterize them as old and hackneyed, and containing merely ideas borrowed from others, as is not infrequently done, is as if we were to criticise the want of originality displayed in the enunciation of any other immutable principle, the truth of which has long been asserted in fit language. They declared anew, and as applicable to new conditions, truths which had been already promulgated, but which were certainly not so imbedded in the principles of government of the day as to make their reassertion useless. After the Declaration of Independence most of the States, in adopting constitutions to fit their new relations, incorporated into them bills of rights. The Articles of Confederation did not contain any such formal declaration, but there are scattered through that instrument some of the provisions which are ordinarily to be found in such declarations. The Constitution of the United States also, as originally adopted, did not contain any bill of rights, and this was one of the objections strongly urged against its adoption in the State conventions and generally by leading men. It was one of the two points which Jefferson specially criticised. So strong was the feeling in regard to the importance of having the protection afforded by provisions of such nature that amendments were early proposed to effect the purpose, and the first ten amendments to the Constitution were adopted with that view, and became of force in 1791. The States have, almost without exception, incorporated in their fundamental law those securities against arbitrary power which are usually contained in bills of rights, and the part of the constitution which fixes such securities is sometimes so worded as to make it seem to be of even greater force than other portions of the constitution. The Bill of Rights in Pennsylvania declares that everything contained in it is excepted out of the general powers of government, and shall for ever remain inviolate.

A difference between the objects to which bills of rights in England, and generally in the United States, refer, should be observed, growing out of the nature of the governments in the two countries. In England almost all the provisions are limitations upon the prerogative of the Crown. Though many of the provisions in America have, equally as in England, the object of restraining arbitrary executive power, not a few are particularly meant to limit the power of the legislative department. In America the bills generally contain an express assertion, as the foundation of the governmental system, of the supreme right of the people, who are the source of all power, and then declare limitations which shall be beyond the power of alteration by any of the ordinary instruments of government; there are express enunciations that the legislature shall not do thus and so; and such provisions can unquestionably be altered only by the adoption of a new constitution by the people who have already adopted the prior one. Such limitations as these cannot be created in England. Parliament being by the theory of the English Government the sovereign authority of the land, no law or constitution can in any way limit its power; but the American legislatures are merely agencies of the underlying supreme power, the people; and the popular will, as expressed in the constitution, can limit their power as well as that of any other department of government. (W. M. M.)

BILL OR BEAK OF BIRDS (Lat. *rostrum*), the distal portions of the bones of the jaws and associated parts, invested with thickened, hardened, or otherwise modified integument, including the nostrils, forming more or less, but never all, of the mouth, and serving as the principal organ of prehension and mastication, no living birds being provided with teeth or fleshy lips. Birds' wings, furthermore, being devoid of prehensile power, and their feet being mainly devoted to the support and movement of the body, the bill of these feathered bipeds assumes numerous and varied offices usually relegated to the fore limbs of quadrupeds, being virtually hand and mouth in one. This organ takes, holds, and carries other objects than food, and is used for numberless other manual purposes, as nest-building, digging the ground, boring wood; it is the usual weapon of attack and defence; sometime a tactile instrument of great delicacy; in some cases a subsidiary organ of locomotion,—being thus in numberless ways most intimately connected with the visible activities of its possessor. Being a part of the head, and simply an extension of the facial bones of the skull and associate structures, the bill is practically taken to be so much of a bird's face as is sheathed with horny or leathery integument. But the nostrils always open in the bill, which also contains at least a portion of the olfactory organs; and the plumage sometimes (*e. g.*, some parrots) surrounds the nostrils. The bill consists of two parts, the upper and the under mandible, with the mouth-opening between them. The bony framework of the under mandible is the distal portion of the compound inferior maxillary bone, especially its U- or V-shaped symphysial element. The skeleton of the upper mandible consists chiefly of the three-pronged premaxillary bone, which is highly developed in birds, with much or all of the nasal bones, and portions at least of the superior maxillaries and palatines, turbinals, etc. The movement of the under mandible is very free, like that of the lower jaw of most animals. There is usually also provision for movement of the upper mandible by a peculiar arrangement of the palatal bones and muscles and the elasticity of the fronto-maxillary suture. This motion is freest in parrots. The neuration and vasculation of this dense organ are comparatively slight, with some exceptions, as when, in the snipe, the soft end of the bill is abundantly supplied by the trifacial nerve. Certain prominences of the horny sheath in some cases resemble, and have the office of, teeth to some extent, but no recent bird is known to develop true teeth, though the European Jurassic *Archæopteryx*, and American Cretaceous birds, such as *Hesperornis* and *Ichthyornis*, were provided with them, inserted either in grooves or in sockets.

The indifferent shape of the bill is simply conical, but the deviations from this or any other assumed standard are endless. The bill is paragnathous, when the mandibles are of about equal lengths, so that their tips fall together; epignathous, when the upper mandible overhangs the other, as in a bird of prey; hypognathous, when the under mandible is the longest (skimmer); metagnathous, when the mandibles are crossed at the end, as in the crossbill, where the skull and muscles of the jaw are quite unsymmetrical. The end of the bill is bent to one side in the genus *Anarhynchus*. Leading forms of the bill have furnished a means of classifying birds: the orders established upon these modifications of shape are obsolete, but their names are still found convenient descriptive terms. Thus, a fissirostral bill is one very deeply cleft, as in a swallow or goatsucker; a tenuirostral bill is slender and elongate, as in the humming-bird; a dentirostral bill is toothed or nicked near the end, as in a falcon or shrike; a conirostral bill is exhibited by the great family of the finches. A snipe's bill is longirostral; a plover's, pressirostral; a heron's, cultrirostral; a duck's or flamingo's, lamellirostral. Many more special descriptive terms are used: as, compressed, depressed, terete, recurved, decurved, acute, obtuse, acuminate, falcate, hamulate, serrate, dentate, spatulate, etc. The distal extremity is the tip or apex; the proximal is the base; the rest, the continuity. The culmen is the superior median lengthwise line of the bill, or its upper outline; the gonys is the corresponding opposite or under outline as far as the rami or forks of the under mandible are united—the word being also used to indicate the prominence which often marks their union; in any event, to be distinguished from the under margin of either ramus. The opposed edges of the upper and lower mandible are the tomia—an upper and under tomium on each side. The line of closure of the mandibles is the commissure. The sides of the mandibles lie between the tomia and the culmen or gonys. The outline of the base of the bill varies endlessly, according to manner and extent of its feathering; special projections of feathers on each side of the culmen form frontal antiæ. The nostrils appear upon the upper mandible in various ways, usually in a depression, the nasal fossa or nasal sulcus; they may be basal, subbasal, or even terminal, according to their situation at or near the base or at the end of the bill; they may be pervious or impervious; or perforate, said when they openly communicate with each other. They are culminal when on the ridge of the bill; lateral or depressed when lower down; naked, scaled, or feathered; linear to circular, even tubular; paired, or united in one opening. The gape or rictus, resulting from separation of the mandibles, usually extends beyond the proper base of the bill, sometimes not; in the latter case it equals the commissure in length.

The sheath of the bill is in the great majority of birds hard and horny throughout. It is seldom otherwise in land-birds, and acquires almost ivory-like density in some of the woodpeckers, for example. It is rather of a leathery texture in many water-birds, as the snipe, goose, duck; in the latter there is a horny nail at the end. The bill of a woodcock or snipe is specially soft and nervous at the end. The nasal scale is soft and tumid in pigeons. In parrots and birds of prey the base of the upper mandible is saddled with a softish membrane, the cere, in or at the edge of which the nostrils are always pierced; this is usually naked. in some parrots densely feathered, the nostrils then appearing removed from the bill to the head; but this is only an appearance. The jägers have a sort of false cere. The puffins have a fleshy rosette at the angle of the commissure; but various caruncles about the bill of different birds *generally* belong rather to the head than to the bill proper. The sheath of the bill may be variously corrugated, rugous, sulcate, carinate, papillose, etc. It is either entire or pieced; the latter specially in the petrel family, where the regularity of the piecing is such that the parts have received special names. The entire sheath of both mandibles together is the rhamphotheca; of the upper alone, the rhinotheca; of the under alone, the gnathotheca. Once formed, it is normally permanent and undergoes no further obvious changes. But in the American white pelican a large upright horny plate is periodically developed in the breeding-season, and shed; and in the puffin and various other species of the auk (see AUK) family a part, or even the whole, of the horny sheath, in one or several pieces, is annually shed and renewed from an underlying membrane, in a manner analogous to the casting of deers' antlers. Such a rhamphotheca is said to be caducous or deciduous. In any case, the bill-sheath is simply modified integument, like claws, hoofs, or horns, and still more similar to the covering of the feet. (E. C.)

BIMETALLISM, a name given to the opinion that the use of both gold and silver as currency, and not alone that of one of these two metals, is desirable and even necessary for the industrial welfare of mankind. Thirty years ago the opposite opinion, or Monometallism, was advocated by those who thought the gold discoveries of Australia and California would cause such a fall in the value of that metal as must lead to its demonetization. At present the Monometallists are advocating the retention of gold and the demonetization of silver by at least the civilized part of mankind.

The main reason which led to this change of opinion is the actual fall in the value of silver as measured in terms of gold. The bimetallists are those who maintain that this fall is due not to natural causes, such as a supply of silver decidedly in excess of the world's need of that metal for currency and other uses, but to certain missteps in fiscal policy, whose retrieval—as they believe—would restore silver to the place it has held in human estimation ever since the dawn of civilization. The most distinguished representatives of this opinion are Baron von Kardoff, A. Wagner, A. Schäffle, Henri Cernuschi, and Prof. E. Laveleye on the continent of Europe, Ernst Seyd and Hon. G. J. Goschen in England, and Henry C. Carey, Prof. F. A. Walker, Hon. Wm. D. Kelley, Hon. John P. Jones, John B. Howe, and W. F. Balch in the United States.

The demonetization of silver began in 1819, when the United Kingdom began the resumption of specie payments, which had been suspended since 1797. Up to that time gold and silver had been equally legal tender for all amounts; but it was resolved (1) to make gold alone legal tender for any sum in excess of forty shillings; and (2) to get rid of the excess of silver beyond the needs of the kingdom for change, by so altering the relations of the two metals in value as to make the import of gold and the export of silver profitable. For more than half a century England found no imitators. But by that time the arguments of English economists in favor of the single standard had begun to make some impression even on practical people, and this had been deepened by indications that an excessive supply of silver from the Bonanza mines of Nevada might be expected. In 1867, in connection with the Paris Exhibition of that year, an international monetary conference was held at Berlin, and delegates from the United States, among others, supported resolutions advocating the demonetization of silver.

The war of 1870–71, by securing to Germany a large sum of gold and merchantable paper equivalent to gold, in payment of the indemnity of one billion dollars exacted from France, put Germany into a position to establish the single gold standard for herself. As a very large amount of her international commerce is transacted with the United Kingdom, this proposal was welcomed by the business community as a convenience. The German Minister of Finance, Herr Delbrück, in this as in other matters, was in sympathy with the English school of economists. The law of December 4, 1871, to supersede the local coinage by an Imperial coinage, demonetized silver by restricting its coinage to the amount regarded as necessary for change. Of the silver previously in circulation, about $260,000,000 worth was called in by 1878, and only $106,650,000 worth recoined by the Imperial mint; while of gold $2,275,000 worth was called in, and $409,500,000 was issued in the new coins. This left $153,350,000 worth of silver in the Imperial treasury, to be disposed of in the silver market in such quantities as could be sold without loss. In the half-decade 1866–70, the average price of silver had been 60⅝ pence an ounce, being one ounce of gold to 15·55 ounces of silver, while the European standard of coinage valued one ounce of gold at 15·50 ounces of silver. During these sales on account of the German treasury, it fell in value, and at one time in 1878 it was sold at 49 pence an ounce. From this it rallied slightly when the German treasury was deterred from further sales by heavy losses, but it again declined, and now sells at a trifle more than 50 pence an ounce. Bimetallists believe that it would be much higher but for the general consciousness that Germany holds great quantities which she will throw upon the market as soon as the price warrants this step.

The influence of Germany's action was felt in other quarters than the silver market, and its results everywhere had the effect of increasing the depression of silver. The Scandinavian states (1872–5) followed her in adopting the single gold standard, and although the amount of their coin circulation is not large—the new gold coinage of 1872 amounting to but $20,021,055 in value—the act served to inflict a fresh blow on the prestige of silver. In the United States, where the importance of the matter was not understood, a law was passed in 1873, without much consideration, for the demonetization of this metal, and received the votes of some who afterwards labored most earnestly for its repeal.

The Latin Union—an international association, formed in 1867 for the regulation of coinage, and embracing France, Italy, Belgium, Switzerland, Greece, and Roumania—had hitherto maintained the free coinage of both metals on private account. It found itself obliged (in 1874–7) to abandon this policy, or else consent to be flooded with a metal which its neighbors on all sides were doing their best to discredit. If free coinage of silver were continued, all the gold held by the countries within the union would be exported, and its place supplied by a metal which already had declined much below the value fixed by the international double standard, and which might decline still further. By an international agreement of 1874 the coinage of silver was limited; by that of 1877 it ceased. Since that time, both France and Italy have been maintaining in practice the single gold standard, having indeed no choice in the matter. The Bank of France hoards a gold reserve for the maintenance of national credit and the discharge of international obligations. Italy has resumed specie payments in gold, having borrowed the bullion needed for a new coinage in the money-markets of Northern Europe. And in the United States the same is true. The Silver Bill of 1878, as originally reported by Mr. Bland from the House Committee on Coinage, did propose the full remonetization of silver by authorizing its unlimited coinage at the ratio of 1 : 16 on private account. But the bill as finally passed restricted coinage to two million dollars a month on government account. And the Secretaries of our Treasury, like the Bank of France, have been agreed in regarding their stock of gold alone as the reserve for the security of the notes they are obligated to redeem on presentation.

Besides these pieces of direct government action on the silver question, the silver-market has been affected very unhappily by the creation and the service of the East Indian debt. The East Indian trade formerly absorbed a large amount of silver every year in payment of balances due to India and the neighboring nations. In this way a surplus of silver was transferred from Europe and America to those Oriental countries which use silver chiefly or exclusively as currency. When the British government, in 1858, took India under the direct rule of the Crown, a vast system of public works was begun, embracing railroads, canals for both traffic and irrigation, and the like. The capital needed was borrowed, not in India, but in England, and as much of it was expended in the purchase of rails, tools, and other supplies, in England, it made little or no addition to the monetary resources of India. But it was contracted that the interest should be paid in London in gold, and much of it under a guarantee of minimum dividends from the East Indian government. As a consequence, that government, having no gold at its command in India, must sell for gold bills of exchange on Calcutta to raise the amount of gold needed for the payment of the interest, etc., for the purchase of military stores, for military pensions, and so forth. Of course, the whole amount of these sales is deducted from the export of silver to India, which otherwise would be effected. In the decade 1856–66, the export of silver averaged $51,429,700 a year; in the decade 1866–76, the annual average was but $21,800,436. In the following years this amount was increased by large loans effected in London on account of the war with Afghanistan; but only reached the average of 1856–66 in the fiscal year 1877–8, while in the year following it fell to $19,309,910, and in 1880–81 to $18,690,850. Had even the average of 1856–66 been maintained, without the expansion which might have been expected with the growth of commerce, the export of 1866–80 would have been $119,001,380 more than it was. This of itself has helped to burden the silver market, and to lower its price by increasing the surplus left in Europe. The remedy for this evil is not easily found.

The only cause for the fall of silver admitted by monometallists generally is one whose sufficiency is disputed by the bimetallists. It is the rapid increase of the supply of silver as compared with that of gold. According to Dr. Adolf Soetbeer, the average annual production of the two metals for the last six half-decades has been as follows, estimating value in millions of dollars at the European standard of 1 : 15.5:

	Gold value.	Pr. ctg.	Silver value.	Pr. ctg.	Both.
1851-55, ...	131.20	77.6	37.99	22.4	169.19
1856-60, ...	136.85	77.9	38.82	22.1	175.67
1861-65, ...	123.03	72.3	47.14	27.7	170.17
1866-70, ...	127 56	69.0	57.30	31.0	184.86
1871-75, ...	113.31	57.3	84.48	42.7	197.79
1876-80, ...	112.90	51.3	107.18	48.7	220.08
Total, ...	3724.25		1864.55		5588.80
Annual average for thirty years, . .	124.14	65.6	62.15	34.4	186.29

These figures are not exactly what either the friends or the enemies of bimetallism would like them to be. On the one hand, they show an increased production of silver, both absolutely and relatively to the whole yield of the two metals, which seems to furnish ground for alarm with reference to the future of that metal. On the other, they show an equally marked diminution in the supply of gold, which raises still more serious doubts as to the quantitative adequacy of that metal for the world's uses as coin. And this decline is a much more serious one, and the increase in the supply of silver much less excessive, than appears on the surface. Since 1856, when the gold supply reached its maximum, the population of the gold-using nations has increased very greatly, and their demand for gold for purposes of domestic and international commerce still more rapidly.

It is true that these figures represent gross additions to the stock on hand, and net additions to the coinage of the amount remaining after allowance has been made for abrasion of coin, loss by shipwreck and otherwise, and by the diversion of this metal to use in the useful and ornamental arts. Dr. Soetbeer estimates that in these three decades no less a sum than $1,122,641,500 in gold has been diverted into this last channel, and that at a rapidly increasing rate, the amount in the third decade being more than three times as great as in the first; that in the second, more than twice as great. The amount employed to increase the world's coinage in the same period he estimates at $2,318,379,700; but here the decades show a decreasing amount; that for the last decade exceeding by but twenty-five millions the amount devoted to the arts in the same years. On the other hand, Dr. Soetbeer estimates that $441,337,400 worth of silver has been diverted to the arts in the same period, while the silver currency of the world has been reduced by $291,434,400 worth. He estimates the gold in use as coin, in 1880, at $3,115,538,500; the silver at $2,000,000,000. In these estimates India and the rest of Eastern Asia are omitted.

If these rates of increase and decrease should continue, the addition of gold to the world's coinage must come to an end, while silver will have been driven out of use in the coinage of Europe and the United States. From this nothing less than a most disastrous shock to the expansion of the world's commerce can be expected And no remedy except the remonetization of silver has been suggested.

It is alleged by some monometallists that the function of money as "the standard of value" cannot be discharged while two metals are used as coin of legal tender. Money, however, is a standard of value in a restricted sense only. The English standard of lineal measure is based on the measurement of Henry VIII.'s foot, and has not varied a hair's breadth since his time. But an ounce of gold in his reign had twelve times the purchasing power it had at the era of the French Revolution, the change having been effected by a thirty-fold increase of the supply of the precious metals in Europe. All commodities decline in value with the growth of man's power over nature's resistance, gold and silver not excepted. These two metals are preferable for use in coinage because they change in value less than do other commodities. It is certainly undesirable to have any changes in the value of coin, but the greatest change is that which would be effected by making the world dependent upon the diminishing supply of gold. The supply of both metals, as is shown by the table given above, is steadier than that of either, the increase in silver tending to counteract the decrease in gold.

It is also alleged that even an international agreement could do nothing for silver, since its decline is the effect of natural causes. To this it is replied that the value of any commodity is determined by the relation of the demand to the supply. Bimetallists are of the opinion that the supply is not excessive if these artificial and removable restrictions had not been put to the demand. For instance, if a very cheap process were discovered for the extraction of aluminium, and that metal should take the place of iron in a thousand uses, a great and irretrievable decline in the price of iron might result, and this would affect the value of the accumulated supply of iron if it were found in excess of the demand thus limited. But if iron were to fall into disuse through the rise of some opinion or superstition about its use, or by some government prohibition of this metal, its value would fall equally without any reason in the nature of things; and as soon as those opinions were exploded or the prohibition removed, the metal would resume its former place. The demonetization of silver, in the judgment of the bimetallists, finds its parallel in the second and not in the first of these supposed cases. (R. E. T.)

BINGHAMTON, the county-seat of Broome co., N. Y., is on both sides of the Susquehanna River, at the mouth of the Chenango River. The valleys of both rivers are so confined by lofty hills that in turn Indian trails, turnpikes, and railroads, crossing the adjacent country, have been compelled to seek this spot. Binghamton is therefore an important railroad centre. It is on the New York, Lake Erie, and Western Railroad, 215 miles from New York and 208 miles from Buffalo, and is also on the New York, Lackawanna, and Western. Branches of this road also lead to Syracuse and to Utica. Another road gives access to Albany, 142 miles distant, and also to Cooperstown, Sharon, Richfield Springs, and other noted summer resorts in or near the picturesque valley of the upper Susquehanna. The first settlement was made in 1787 by William Bingham of Philadelphia, from whom the village (incorporated in 1818) took its name. An early start was given to manufacturing enterprise by an extensive water-power upon both rivers; and as this has been gradually superseded by steam, the close proximity of the Pennsylvania coal-fields still gives Binghamton decided advantages. The leading articles of manufacture are leather, boots and shoes, cigars, combs, sewing-machines, carriages, and various kinds of machinery. The use of anthracite coal has rid the place of the smoke and dirt incident to other manufacturing centres, and has entitled Binghamton to be called "the parlor city." The streets are broad and well paved. Four road bridges and two railroad bridges span the converging rivers. The city (incorporated in 1867) owns a public park south of its limits and within 4 miles of the Pennsylvania line. It also has a Holly system of water-works, with the Susquehanna as a source of supply; gas is furnished by a private corporation. Binghamton contains a court-house modelled after St. Paul's in London, and a fine county law library. For many years the experiment of the State inebriate asylum was tried in a large granite building at the eastern limits of the city, but the property is now used as a State asylum for the chronic insane. The Susquehanna Valley Home is a refuge for orphan children. Besides the public schools controlled by a board of education, the Roman Catholics sustain two parochial schools and St. Mary's home for the indigent. The city contains seventeen churches, three national banks, one State bank, two savings banks, four hotels, and four daily and four weekly newspapers. The population in 1880 was 17,315. The valuation of property is $6,200,000; public debt, $270,000. For 1881 the yearly expenses were $108,000.

BINNEY, HORACE, LL.D. (1780–1875), a distinguished Philadelphia lawyer, was born in Philadelphia, Jan. 4, 1780. He graduated at Harvard College in 1797, sharing the first honors with Judge D. A. White of Massachusetts, was admitted to the Philadelphia bar in 1800, and soon rose to the highest rank in his profession. In early life he was a frequent contributor to Dennie's *Port-Folio.* He published *Reports of Cases in the Supreme Court of Pennsylvania from 1799 to 1814*, and many addresses and legal pamphlets. He took a leading part in cases before the higher courts of Pennsylvania, and was often retained in important appeals to the Supreme Court of the United States. High judicial positions were offered to him, but were steadfastly declined. Mr. Binney was a director in the first Bank of the United States, and one of the trustees in winding up its affairs. Having come forward in opposition to President Jackson's administration, he was elected to Congress in 1833, where his ability and eloquence at once gained for him a prominent place, but he served only a single term. His greatest case was the defence of the city of Philadelphia against certain heirs of Stephen Girard in 1843 before the Supreme Court of the United States (*Vidal* vs. *the Mayor of Philadelphia*). His argument on this occasion is exhaustive and unanswerable, and has ever since been cited as authority on the law of charitable uses. To the surprise of the public and the regret of his friends, soon after this forensic triumph he retired from practice in the courts. President Tyler immediately offered to nominate him to the Supreme Court of the United States, but Mr. Binney declined on the ground of a resolution that he had early formed not to accept any public position after the age of sixty. Yet he never lost his interest in public affairs, and his influence increased with his years. Few men in the full vigor of their active life have accomplished so much as he did in his later years. He was a model lawyer, learned, skilful, eloquent, and lofty in character. He published *The Leaders of the Old Bar of Philadelphia* (1859), giving vivid portraits of eminent jurists; *An Inquiry into the Formation of Washington's Farewell Address* (1859), opposing the claim made in behalf of Alexander Hamilton as principal author of that document; *The Privilege of the Writ of Habeas Corpus under the Constitution* (1862), maintaining the President's power to suspend the writ without previous authority from Congress. The last subject he still further investigated and elucidated in 1865. His eulogiums on Chief-Justice Tilghman (1827), on Chief-Justice Marshall (1836), and on Hon. John Sergeant (1852) are models of eloquence and pathos. He died Aug. 12, 1875. His son HORACE (1809–1870), a lawyer of fine ability and scholarly tastes, was a prominent and patriotic citizen of Philadelphia.

See Vol. III. p. 604 Am. ed. (p. 699 Edin. ed.).

BIRDS (NORTH AMERICAN). Referring to the article BIRDS in the body of the ENCYCLOPÆDIA, we may here supplement that extended and able treatise with additional details respecting the North American or Nearctic Avifauna. The Nearctic Region properly includes. besides Greenland, portions of Mexico, extending along the highlands or *tierras frias* of the latter nearly or quite to the isthmus of Tehuantepec, but not nearly so far in the lowlands or *tierras calientes* —on an average about to the Tropic of Cancer. But the line used in constructing the current list of "North American" birds as distinguished from those of Mexico is an artificial one, corresponding nearly with the present political boundary of the United States, running from the mouth of the Rio Grande along the southern borders of Texas, New Mexico, Arizona, and California, some birds of Lower California being nevertheless arbitrarily included. The area thus indicated is faunally characterized both negatively, by the absence of various families and orders of birds, and positively, by the presence of others, as given below.

The latest list of North American birds gives 888 species (including enumerated sub-species), of 350 genera, of 63 families, of 13 orders of the sub-class *Carinatæ.* Of these 888, 168 are given only as sub-species, leaving 720 as distinct. A few have since been added. The total of North American birds (distinct species and recognizable sub-species, geographical races, or "varieties") may be set roundly at 900. Of this large total estimate, however, about 40 are scarcely distinguished varieties or are altogether dubious birds, and about 65 others are good species, but not fairly North American, being mere stragglers, chiefly from the Old World, and especially Europe. The steps in the progress of our knowledge are thus indicated: Wilson in 1814 gave a total of 283; Bonaparte (1838), 471; Audubon (1844), 506; Baird (1858), 744; Coues (1874), 778; Ridgway (1880), 924; Coues (1882), 888. The catalogues of 1880 and of 1882 are nearly coincident, the excess of the former arising chiefly from the inclusion of various extra-limital species which are excluded from the latter. The statistics of the present article are derived from the latest list, with which the nomenclature is conformed; the estimates respecting exotic families being chiefly based upon Wallace, to whose writings the reader is referred for more complete details.

Among the prime divisions or sub-classes of the class *Aves*, North America lacks two—namely, the *Saururæ*, represented alone by the *Archæopteryx* of the Jurassic of Europe; and the *Ratitæ*, including all the struthious birds, of the families *Struthionidæ*, *Rheidæ*, *Casuariidæ*, *Apterygidæ*, etc. On the other hand, the Cretaceous formation of North America furnishes, in the genera *Hesperornis* and *Ichthyornis*, types of two of the prime divisions, *Odontolcæ* and *Odontotormæ*, thus balancing the sub-classes. All the living North American birds are of the fifth sub-class, the *Carinatæ.* The missing groups of *Carinatæ* above the grade of families are: the South American *Dromæognathæ* or tinamous; the Southern and Antarctic *Sphenisci*, or penguins; and the South American *Opisthocomi*, represented by a single species, the hoatzin. (A few other missing groups, sometimes rated above families, are given in the next paragraphs.)

The missing *families* of birds are chiefly the following (none among natatorial orders, excepting the penguins):

1. Among the Waders: the screamers (*Palamedeidæ*), trumpeters (*Psophiidæ*), cariamas (*Cariamidæ*), sun-bitterns (*Eurypygidæ*), quail-snipe (*Thinocoridæ*), and sheath-bills (*Chionididæ*), all of South America; the New Caledonian kagu (*Rhinochetidæ*), the African shoe-bill (*Balænicipidæ*), the African and Indian runner (*Dromadidæ*), with the Old-World bustards (*Otididæ*), swallow-snipes (*Glareolidæ*), and certain other genera, perhaps types of separate families.

2. Among Gallinaceous birds: the Indian bush-quails (*Turnicidæ*), the Australian mound-birds (*Megapodidæ*), the African guinea-fowls (*Numididæ*), and all the pheasants proper (*Phasianidæ*).

3. Among Columbine birds: the sand-grouse (*Pteroclctidæ*—often rated above a family), dodo-pigeon (*Didunculidæ*), and dodos (*Dididæ*).

4. Among Raptorial birds: the African serpent-eater (*Gypogeranidæ*), the Old-World vultures not being a family distinct from *Falconidæ.*

5. Among Psittacine birds: the ground-parrots

(*Stringopidæ*) and such other families of *Psittaci* as there may be, with one exception.

6. Among Picarian birds (non-passerine *Insessores*): the South American guacharo (*Steatornithidæ*), and Old-World frog-mouths (*Podargidæ*), the African laughers (*Irrisoridæ*), and Old-World hoopoes (*Upupidæ*) and horn-bills (*Bucerotidæ*); the South American motmots (*Momotidæ*), and West Indian todies (*Todidæ*); the Old-World rollers (*Coraciïdæ*) and bee-eaters (*Meropidæ*); the South American jacamars (*Galbulidæ*) and puff-birds (*Bucconidæ*); the African colies (*Coliïdæ*), turacoes (*Musophagidæ*), and guides (*Indicatoridæ*); the Madagascan *Leptosomatidæ*; the South American toucans (*Rhamphastidæ*); the barbets of both hemispheres (*Megalæmidæ*); the pygmy woodpeckers (*Picumnidæ*) of both hemispheres, and the Old-World wry-necks (*Yungidæ*). It will be observed of this series that nearly as many South American or West Indian family types as Old-World ones are missing from North America.

7. Among Passerine birds (to include here the uncertain Madagascan *Philepittidæ* and *Mesitidæ* and the anomalous Australian *Menuridæ* and *Atrichiïdæ*); the South American large families *Formicariïdæ* and *Dendrocolaptidæ*, with the chatterers (*Cotingidæ*), manakins (*Pipridæ*), rock-cocks (*Pteroptochidæ*), and leaf-cutters (*Phytotomidæ*) of the same continent, these being the only American *Passeres* absent from North America. All the following belong to the Old World: the Madagascan and Australian families above named; the broad-bills (*Eurylæmidæ*); the ant-thrushes (*Pittidæ*); the starlings (*Sturnidæ; one species, however, straggling to Greenland), and weavers (*Ploceidæ*); the birds of Paradise (*Paradiseidæ*); the sun-, flower-, and honey-birds (*Nectariniïdæ*, *Dicæidæ*, *Drepanidæ*, *Meliphagidæ*); the bush-, cuckoo-, drongo-, and thick-head shrikes (*Artamidæ*, *Campephagidæ*, *Dicruridæ*, *Pachycephalidæ*); the true orioles (*Oriolidæ*); the bulbuls (*Pycnonotidæ*); the hill-tits (*Liotrichidæ*); the whole of that ill-assorted group known as *Timeliïdæ;* the great family of the true fly-catchers (*Muscicapidæ*); while another Old-World family of great extent, the *Sylviïdæ* (scarcely separable from *Turdidæ*, however), is barely represented in North America. It will be observed that all the oscine passerines which are wanting in North America belong exclusively to the Old World.

Setting aside *Chamæidæ*, dubiously regarded as a family represented by a single species, *Chamæa fasciata*, North America has absolutely no family of birds peculiar to itself. Out of its 63 families, 7 are properly shared only with the Old World—namely, *Certhiidæ*, *Sittidæ*, *Paridæ*, *Laniïdæ*, *Sturnidæ* (a mere accident in Greenland), *Colymbidæ*, *Alcidæ;* though all these except *Sturnidæ* actually reach other parts of America; 11 are confined to the New World—namely, *Sylvicolidæ*, *Cærebidæ*, *Tanagridæ*, *Vireonidæ*, *Icteridæ*, *Tyrannidæ*, *Trochilidæ*, *Cathartidæ*, *Cracidæ*, *Meleagrididæ*, *Aramidæ;* all the rest being more nearly or quite cosmopolitan. Again, of these 63 families, the *Sturnidæ* really do not belong to North America; of 8—namely, *Cærebidæ*, *Trogonidæ*, *Cracidæ*, *Aramidæ*, *Parridæ*, *Phœnicopteridæ*, *Plotidæ*, *Phaëthontidæ*—only a single species reaches the southern border; *Psittacidæ* is represented by a single species; *Alcedinidæ* and *Tanagridæ* by a single genus; *Tyrannidæ* and *Trochilidæ* by few species in comparison with their great numbers elsewhere. Therefore, being represented by scarcely one peculiar family, *Chamæidæ;* by only one highly characteristic family, *Sylvicolidæ;* by one or but few species of several families of large extent elsewhere; by several families shared with the Old World; and mainly by families of very wide or cosmopolitan distribution,—North America is not strongly marked as one of the primary zoological regions of the globe so far as birds are concerned.

Considering the genera in like manner, it is found that out of some 350 now current, only about 75, or little more than one-fifth, are peculiar to North America or characteristic of that country in the sense that they have no other than North American species; while nearly all of these species extend their range beyond North America, the genera and species absolutely confined to this country being very few indeed. We may amplify the case by passing the birds in rapid review, taking them up by families from lowest to highest.

Pygopodes.

1. *Alcidæ:* auks, murres, guillemots, etc. (See AUK and ALCIDÆ.)

2. *Colymbidæ:* loons. One genus, *Colymbus*, with three species (*C. torquatus*, *arcticus*, *septentrionalis*), of the northern hemisphere at large, with two additional sub-species peculiar to North America; generally distributed over inland as well as coast waters.

3. *Podicipedidæ:* grebes. Cosmopolitan; well represented in North America by about one-fourth of the known species, and generally distributed. The genus *Æchmophorus*, with one species (*A. occidentalis*) and one sub-species (*A. o. clarki*) is peculiar; *Podilymbus*, of one or two species, is North and South American; of the five representatives of *Podicipes*, one (*P. cornutus*) is common to Europe, etc., two (*P. auritus californicus* and *P. griseigena holboelli*) are little distinguished from their Old-World representatives, and the fifth (*P. dominicus*) is tropical American, barely reaching the Rio Grande. The pied-billed grebe (*Podilymbus podicipes*) and the horned grebe (*Podicipes cornutus*) are common and widely distributed in North America; the red-necked grebe (*P. griseigena holboelli*) is next most so; the others are confined to the West.

Longipennes.

4. *Procellariïdæ:* petrels, etc. Cosmopolitan; a rather large family of exclusively marine birds, fairly well represented on both coasts by some 32 species or sub-species, referable to 15 genera. But this large list results in part from the accidental visits of these wide-ranging sea-birds, many of which do not belong to North America at all, and have for the most part been observed but one or twice: such are the sooty albatross (*Phœbetria fuliginosa*), two fulmars (*Ossifraga gigantea* and *Priocella tenuirostris*), four petrels (*Daptium capense*, *Œstrelata hæsitata*, *Œ. gularis*, *Œ. bulweri*), one or two stormy petrels (*Fregetta grallaria*, and probably *Procellaria pelagica*), and some of the shearwaters (*Priofinus melanurus*, and probably *Puffinus kuhli* and *P. anglorum*, but the species of the latter genus are not well determined). Very few *Procellariïdæ* have actually been determined to breed in North America, though most of the list—the stragglers of course excepted—probably do so. The best-known cases are those of Leach's petrel (*Cymochorea leucorrhoa*) in New England, and of the fulmars (*Fulmarus glacialis pacificus* and *F. g. rodgersi*) in Alaska. The Atlantic coast has no albatross; the Pacific has two common species, the short-tailed (*Diomedea brachyura*) and the black-footed (*D. nigripes*). Fulmars abound on both coasts northerly. Two species of stormy petrel, Leach's and Wilson's (*Cymochorea leucorrhoa* and *Oceanites oceanicus*), are common on the Atlantic coast; the Pacific has a larger number (*Halocyptena microsoma*, *Cymochorea melæna*, *C. homochroa*, *Oceanodroma furcata*, *O. hornbyi*), mostly characteristic. Shearwaters to the number of about nine are about equally divided between the two shores, the commonest and best known being the wandering and dusky shearwaters (*Puffinus major* and *P. fuliginosus*), which abound off the New England coast.

5. *Laridæ:* gulls, terns, etc. A large cosmopolitan family, fully represented by about 46 species of 11 genera, the missing generic types being only two or three among the terns. (*a*) All four of the established species of skua-gulls of the northern hemisphere occur (*Stercorarius skua* (very rarely), *S. pomatorhinus*, *S. parasiticus*, *S. buffoni*). (*b*) The genus *Larus* itself has perhaps 14 species, mostly common and widely dis-

tributed, in fair proportion peculiar to the continent; the leading ones are the glaucous (*L. glaucus*), white-winged (*L. leucopterus*), and black-backed (*L. marinus*), all shared with other countries; the American herring-gull (*L. argentatus smithsonianus*); the Pacific glaucous-winged gull (*L. glaucescens*); the Californian (*L. californicus*); the ring-billed and American mew-gulls (*L. delawarensis* and *L. brachyrhynchus*); the last five characteristic of North America. The white-headed gull (*L. heermanni*) is of the California coast and southward. The common kittiwake (*Rissa tridactyla*) is of circumpolar distribution; the red-legged kittiwake (*R. brevirostris*) abounds in the North Pacific. Three species of hooded gulls (*Choïcocephalus atricilla, C. franklini, C. philadelphia*) are highly characteristic of North America, though not absolutely confined to it. The extremely rare wedge-tailed gull (*Rhodstethia rosea*) seems to have its headquarters about Melville Island; the fork-tailed gull (*Xema sabinii*) is a characteristic northern form. The exceedingly rare swallow-tailed gull (*X. furcata*), supposed to be a native of the Galapagos, is ascribed also to California. (*c*) The true terns of the genus *Sterna* are equally numerous; 14 good species inhabit the continent, but probably none are absolutely confined to it. They are the marsh, Caspian, Cayenne, elegant, Sandwich, common, Forster's, arctic, roseate, least, Trudeau's, Aleutian, sooty, and bridled (*S. anglica, caspia, regia, elegans, cantiaca, hirundo, forsteri, macrura, dougalli, antillarum, trudeaui, aleutica, fuliginosa, anæsthetica*), —nearly all of them wide-ranging species, some not only in America, but in the Old World as well. Two species of *Hydrochelidon* (*H. lariformis* and *H. leucoptera*—latter only a waif from Europe), with the noddy tern of the southern coast (*Anous stolidus*), complete the list. (*d*) One of the two or three known species of *Rhynchops*, the black skimmer (*R. nigra*), abounds on the South Atlantic coast.

Steganopodes.

6. *Phaëthontidæ:* tropic-birds. Two species (*Phaëthon æthereus, P. flavirostris*) casually reach our coast.

7. *Tachypetidæ:* frigate-birds. One species (*T. aquilus*) is common on the southern shores.

8. *Plotidæ:* darters. One of the three or four known species (*Plotus anhinga*) is common on the southern coast.

9. *Phalacrocoracidæ:* cormorants. Well represented by about 10 species of the genus *Phalacracorax*, mostly peculiar to North America or highly characteristic of that continent. (See CORMORANT.)

10. *Pelecanidæ:* pelicans. Fair representation by two common species, the white and brown (*P. americanus, P. fuscus*), the former peculiar, the latter common to South America only.

11. *Sulidæ:* gannets. Like the last, fairly represented by two common species, the white solan and brown booby (*Sula bassana, S. leucogastra*), but neither peculiar.

Anseres.

12. *Anatidæ:* swans, geese, ducks, etc. A large family, perfectly cosmopolitan, here well represented by 59 species of some 24 genera, or about one-half the current number of genera, and rather more than one-fourth the known species; few of the species, however, being peculiar or even highly characteristic. (*a*) There are two peculiar species of swans (*Cygnus buccinator* and *C. americanus*); one or two others have been ascribed to the country, but if not in error these are at most but stragglers from Europe. (*b*) The most characteristic geese are those of the genus *Chen*, which is peculiarly North American; four species are recognized; the blue (*C. cœrulescens*), greater and lesser snow (*C. hyperboreus, C. albatus*), and the remarkable Ross goose (*C. rossi*), together with the emperor goose of Alaska (*Philacte canagica*). The gray geese are either stragglers from Europe (*Anser albifrons*) or closely related (the common white-fronted or speckle-bellied, *A. albifrons gambeli*). The European barnacle goose (*Bernicla leucopsis*) occurs as a straggler; the brant goose is the same as the European (*B. brenta*, with a peculiar variety, the black brant, *B. brenta nigricans*). The common wild goose (*Bernicla canadensis*) is peculiar to North America; it has several sub-species. The warmer parts of America yield to our southern coast two species of tree geese (*Dendrocygna fulva, D. autumnalis*). (*c*) The numerous river-ducks (*Anatinæ*) are mostly wide-ranging species; such are the mallard (*Anas boscas*), pintail (*Dafila acuta*), gadwall (*Chaulelasmus streperus*), and shoveller (*Spatula clypeata*); the European widgeon (*Mareca penelope*), teal (*Querquedula crecca*), and crested red-head (*Fuligula rufina*), occurring, however, only as stragglers; while the dusky duck (*Anas obscura*), the green- and blue-winged teals (*Querquedula carolinensis, Q. discors*), together with the beautiful wood-duck (*Aix sponsa*), are characteristic. The cinnamon teal (*Q. cyanoptera*) is common to both Americas. (*d*) The case of the sea-ducks (*Fuligulinæ*) is nearly parallel. One of the scaups (*Fuligula marila*) is common to both hemispheres; another (*F. collaris*) is peculiar; the pochard scarcely differs from that of Europe (*F. ferina*), while the famous canvas-back (*F. vallisneria*) is peculiar; the golden-eyes (*Clangula glaucium, C. islandica*) are the same, but the buffle-head (*C. albeola*) is peculiar. The extraordinary Labrador duck (*Camptolæmus labradorius*) has long been confined to a small area, and seems upon the point of extinction. The old-wife (*Harelda glacialis*) is an abundant and wide-ranging species in both hemispheres; the harlequin (*Histrionicus torquatus*) and Steller's eider (*Somateria stelleri*) are rarer species of circumpolar distribution. The famous eider-duck (*S. mollissima*) is chiefly represented by a variety of the European (*S. m. dresseri*), which abounds on the North Atlantic coast; the other American eiders are the king (*S. spectabilis*) of the same distribution, with the spectacled (*S. fischeri*) and v-throated (*S. v-nigra*) of the north-west coast. The black scoter (*Œdemia americana*) is specifically distinct from that of Europe; the white-winged scoter (*Œ. fusca*) is the same or but slightly distinguished; the surf-scoter (*Œ. perspicillata*) is a peculiar species, only elsewhere occurring as a straggler. The scoters are all abundant species on the coasts. The ruddy duck (*Erismatura rubida*) is a common species; a related species (*Nomonyx dominica*) occurs only as a straggler from the West Indies. (*e*) Of our three mergansers (*Merginæ*), all of which are common, the goosander (*Mergus merganser*) and red-breasted (*M. serrator*) are shared with the Old World; the hooded (*M. cucullatus*) is peculiar.

Odontoglossæ.

13. *Phœnicopteridæ:* flamingoes. One species (*Phœnicopterus ruber*) of Florida and the Gulf coast, out of about eight of the warmer parts of the world.

Alectorides.

14. *Rallidæ:* rails, gallinules, coots. A large and thoroughly cosmopolitan family, tolerably well represented by 6 genera and 18 species out of some 150. (*a*) The rails proper (*Rallus*) afford the clappers or salt-water hens (*R. longirostris*) in three peculiar varieties; together with the king and Virginian rails (*R. elegans* and *R. virginianus*), both highly characteristic. The crakes (*Porzana*) are of three distinct species—the sora (*P. carolina*), so abundant in the marshes of the Atlantic States, the yellow (*P. noveboracensis*), and the black (*P. jamaicensis*), all highly characteristic. The European crake (*Crex pratensis*) also occurs, but only as a straggler. (*b*) The gallinules are of two genera and species—the Florida (*Gallinula galeata*) and the purple (*Ionornis martinica*), the former characteristic, the latter belonging rather to the West Indies. (*c*) The American coot (*Fulica americana*) is abundantly distributed through the temporate por-

tions of the continent; the European species (*F. atra*) occurs as a straggler.

15. *Parridæ:* jacanas. One species of this small family barely reaches the Rio Grande (*Parra gymnostoma*).

16. *Aramidæ:* courlans. One of the two known species is common in Florida (*Aramus pictus*).

17. *Gruidæ:* cranes. A small but nearly cosmopolitan family, wanting only in Central and South America. Our genus, *Grus*, comprehending most of the species, and coextensive in distribution with the family, has three species peculiar to North America—the whooping crane (*G. americana*) and the Northern and Southern sand-hill cranes (*G. canadensis*, *G. pratensis*).

Herodiones.

18. *Ardeidæ:* herons. A large cosmopolitan family, well represented by 11 genera and 13 species, nearly all characteristic, but probably none actually confined to America. Here are classed the herons, egrets, and bitterns. (See ARDEIDÆ and HERON.)

19. *Ciconiidæ:* storks. We have no true storks, but our wood-ibis, not well so named (*Tantalus loculator*), belongs to this rather small and mostly Old-World family of some 20 species. It abounds in the Southern States and Territories. The jabiru (*Mycteria americana*) barely reaches our southern border.

20. *Plataleidæ:* spoonbills. One species of this small family inhabits the Southern States, the rosy spoonbill (*Ajaja rosea*).

21. *Ibididæ:* ibises. Another small family, represented by two genera and four species. The glossy ibis (*Plegadis falcinellus*) is the same as that of the Old World; the white-faced (*P. guarauna*) is distinct, and our most characteristic species of the South and South-west. The white ibis (*Eudocimus albus*) is common in the South Atlantic and Gulf States, where the scarlet ibis (*E. ruber*) is scarcely found.

Limicolæ.

22. *Scolopacidæ:* snipe, sandpipers, curlews, etc., etc. A large and perfectly cosmopolitan family, well represented by 23 genera and 43 species, a fair proportion of which are characteristic of North America, though perhaps but one (the woodcock) is peculiar to it. The American woodcock (*Philohela minor*) is both generically and specifically distinct from the European woodcock (*Scolopax rusticula*); the latter is occasionally found in this country, but only as a straggler. Our common snipe (*Gallinago wilsoni*) is very closely related to that of Europe, and in fact is often called "English snipe;" but the latter (*G. media*) has only been known to occur as a straggler to Greenland. Characteristic of North America is the gray-back or red-breasted snipe (*Macrorhamphus griseus* and *M. g. scolopaceus*), which abounds throughout the country during its extensive migrations, breeding in the high north, and passing into Middle America in winter. The same extensive migrations and boreal breeding-grounds mark most of the true sandpipers, of which our species are numerous. The stilt sandpiper (*Micropalama himantopus*) and the semipalmated (*Ereunetes pusillus*) are characteristic species, as are most of those of the genus *Actodromas*, such as the least sandpiper (*A. minutilla*), so abundant with the semipalmated on the beaches, the large pectoral sandpiper (*A. maculata*), and Bonaparte's (*A. bonapartii*). The purple sandpiper (*Arquatella maritima*) is a circumpolar species, with two congeners in Alaska (*A. couesi*, *A. ptilocnemis*). The sanderling (*Calidris arenaria*) and knot (*Tringa canutus*) are common to the Old World; the American dunlin (*Pelidna alpina americana*) is a variety of that of Europe, which latter (*P. alpina*) has occurred in Greenland. The curlew sandpiper (*Ancylochilus subarquatus*) is scarcely more than a straggler from the Old World. The extraordinary spoon-billed sandpiper (*Eurynorhynchus pygmæus*) is reported to occur on the Arctic coast of Alaska. Our godwits are two characteristic species, the great marbled and Hudsonian (*Limosa fœda* and *L. hæmastica*), with two others, stragglers from Europe and Asia respectively. The willet (*Symphemia semipalmata*) is peculiarly American, though, like the rest, not confined to North America. Our tattlers, greater and lesser (*Totanus melanoleucus*, *T. flavipes*), are in like case, and we have the greenshanks (*T. glottis*) as a straggler from Europe. The solitary sandpiper (*Rhyncophilus solitarius*) is also accompanied by its analogue (*R. ochropus*) as a straggler. One of the most abundant and familiar species of this family is the spotted sandpiper (*Tringoides macularius*). The ruff or reeve (*Machetes pugnax*) is not American, but frequently occurs as a straggler. The Bartramian (*Bartramia longicauda*) and buff-breasted (*Tryngites rufescens*) sandpipers are both highly characteristic species. The *Heteroscelus incanus* reaches the west coast from islands of the Pacific. Five species of curlews occur, three of them characteristic.

23. *Phalarapodidæ:* phalaropes. All the species of this little family, one of them confined to America, the rest wide-ranging: Wilson's phalarope (*Steganopus wilsoni*, characteristic), the northern phalarope (*Lobipes hyperboreus*), and the red or gray (*Phalaropus fulicarius*).

24. *Recurvirostridæ:* avocets and stilts. A small group, fairly represented by the American avocet (*Recurvirostra americana*) and black-necked stilt (*Himantopus mexicanus*).

25. *Hæmatopodidæ:* oyster-catchers and turnstones. Another small group, fully represented by the characteristic American oyster-catcher (*Hæmatopus palliatus*), together with the European species (*H. ostrilegus*) as a straggler, and two turnstones, one (*Strepsilas interpres*) wide-ranging, the other (*S. i. melanocephalus*) peculiar to the Pacific coast. Here also appears to belong the curious surf-bird (*Aphriza virgata*) of the Pacific coast and islands.

26. *Charadriidæ:* plovers, etc. Like the *Scolopacidæ*, this is a large cosmopolitan family, but one not so well represented in North America, as it is by only 5 genera and 14 species or sub-species. The almost cosmopolitan black-bellied plover (*Squatarola helvetica*) is abundant. Three recognized varieties of the golden plover occur—the American (*Charadrius dominicus*), the Asiatic (*C. d. fulvus*), and the European (*C. d. pluvialis*); but the two latter only as stragglers, the former being abundant and characteristic. The large genus *Ægialites* absorbs seven species, two of which, however, are only stragglers from Europe, those proper to North America being the well-known killdeer (*Æ. vociferus*), the semipalmated and piping ring-necks (*Æ. semipalmatus* and *melodus*, and perhaps a variety of the latter), so common on the beaches, and the southerly *Æ. wilsonius*. The Rocky Mountain plover (*Podasocys montanus*) is confined to Western North America. The European lapwing (*Vanellus cristatus*) is only a straggler from Europe.

Gallinæ.

27. *Tetraonidæ:* grouse, partridge, quail. The North American grouse are among the most characteristic birds of the continent, several genera and all the species, excepting some of the ptarmigan, being peculiar, and the grouse proper (*Tetraoninæ*) here reaching their highest development. (*a*) There are 6 genera and 16 species or sub-species of grouse proper: the great sage-cock of the West (*Centrocercus urophasianus*); the sharp-tailed grouse or prairie-hen (*Pediœcetes phasianellus* and *P. p. columbiana*) of the North-west and West; the pinnated grouse or prairie-chicken (*Cupidonia cupido* and *C. c. pallidicincta*) of the interior; the Canada or spruce grouse (*Canace canadensis* and *C. c. franklini*) of the Northern States and northward, across the continent; the ruffed grouse (known as "partridge" in the North and "pheasant" in the South, *Bonasa umbella*, with its varieties *B. u. umbelloides* and *sabinii*) of similar but more extensive

distribution; the dusky grouse (*C. obscurus* and *C. o. richardsoni* and *fuliginosa*) of the Rocky Mountains and thence to Alaska; together with at least three distinct species of ptarmigan or snow-grouse (*Lagopus albus*, *L. rupestris*, and *L. leucurus*—the first two common to other countries, the last peculiar to the Rocky Mountains). (*b*) The partridges or quail are fewer, only eight in all. These are the common Virginian partridge, called quail at the North (*Ortyx virginiana*, with its varieties *floridana* and *texana*); the beautiful mountain-quail of California (*Orortyx picta*); the equally elegant plumed quail of the South-west (*Lophortyx californica*, *L. gambeli*); together with the blue quail (*Callipepla squamata*) and Massena quail (*Cyrtonyx massena*) of the same region. It should be noted that the terms "quail" and "partridge," as used in this country, have no distinct significance; that all the American quails or partridges are not only specifically, but also generically, distinct from those birds of the Old World from which these names have been borrowed; and that no bird to which the name "pheasant" can properly be applied occurs in America. The Messina or true quail of Europe (*Coturnix dactylisonans*—not to be confounded with the Massena above given) has been extensively imported, and may become naturalized in the United States.

28. *Meleagrididæ:* turkeys. One genus of two or three species, alone representing in America the magnificent family of Old-World pheasants (*Phasianidæ*). The turkey occurs wild in North America under two forms—*Meleagris gallipavo*, of the South-west and Mexico, believed to be the original stock of the domesticated breed; and *M. gallipavo americana*, the common wild turkey of the United States. *M. ocellata* is a very distinct Central American species.

29. *Cracidæ:* curassows, guans, etc. A considerable family, representing in Central and South America the Australian *Megapodidæ;* a single species, the Texan guan (*Ortalida vetula maccalli*) reaching our border.

Columbæ.

30. *Columbidæ:* pigeons, doves. Considering the immense development of the family in other parts of the world, some 350 species being described, North America must be considered poor in pigeons with her dozen species, though of nearly as many genera, and at least three of the sub-families. (*a*) Of *Columbinæ* proper, the famous passenger pigeon (*Ectopistes migratorius*) is the most characteristic and one of the most generally distributed species, all the others being of local distribution, and most of them southerly. Three species of *Columba* occur—the band-tailed pigeon of the West (*C. fasciata*); the red-billed of Texas (*C. erythrina*), and the white-crowned of Florida (*C. leucocephala*). (*b*) Of the *Zenaidinæ* the best known and most widely distributed is the Carolina dove (*Zenaidura carolinensis*). The smallest is the ground-dove of the Southern States (*Chamæpelia passerina*). The white-winged (*Melopelia leucoptera*) is common in the South-west, but *Engyptila albifrons*, *Zenaida amabilis*, *Scardafella inca*, and *Geotrygon martinica* are little more than visitors to our southern border. (*c*) The remarkable blue-headed pigeon of Florida (*Starnœnas cyanocephalus*) is the type of a sub-family of quail-like ground-pigeons.

Raptores.

31. *Cathartidæ:* American vultures. A small group of five genera and seven species, remarkably distinguished from Old-World vultures. (See CATHARTIDÆ.)

32. *Pandionidæ:* ospreys. We have the cosmopolitan fish-hawk (*Pandion haliaëtus*), which alone composes this family.

33. *Falconidæ:* hawks, eagles, buzzards, etc. A great cosmopolitan family of some 300 species, fully represented in North America by 17 genera and 45 species and sub-species, a fair proportion of them being characteristic. (*a*) The abundant marsh-harrier (*Circus cyaneus hudsonius*) is a variety of the European. (*b*) The group of the kites is represented by the swallow-tailed (*Elanoïdes forficatus*), the black-shouldered (*Elanus glaucus*), the Mississippi (*Ictinia mississippiensis*), and the everglade (*Rostrhamus sociabilis plumbeus*), the last a variety of a tropical species, the first a peculiar genus and species, the others peculiar species. (*c*) The hawks proper, of the genera *Accipiter* and *Astur*, are near their European analogues, but distinct species, the goshawk (*Astur atricapillus*), the sharp-shinned, and Cooper's (*Accipiter fuscus*, *A. cooperi*). (*d*) The true falcons all belong to the cosmopolitan genus *Falco;* there are 14 species or sub-species, among them Northern jerfalcons of several kinds (*F. sacer*, *islandicus*, *candicans*), the Western lanner (*F. mexicanus*), the wide-ranging peregrine (*F. peregrinus*), the pigeon falcon (*F. columbarius*), and the sparrow falcon (*F. sparverius*), varieties of each of the last three being recognized; the aplomado (*F. fuscicærulescens*) completes the list. (*e*) The remarkable caracara (*Polyborus cheriway*) connects the falcons with the next group. (*f*) The buzzards chiefly belong to the large genus *Buteo*, of which there are 12 species and sub-species, the representative form being the red-tailed buzzard (*B. borealis*) and its Western ally (*B. swainsoni*), with the red-shouldered (*B. lineatus*) and the broad-winged (*B. pennsylvanicus*). The rough-legged buzzard (*Archibuteo lagopus sancti-johannis*) is a variety of the European, but the large and handsome California squirrel hawk (*A. ferrugineus*) is peculiar. The *Onychotes gruberi* is only known by two specimens supposed to come from California. The eagles, which differ but little excepting in size from ordinary buzzards, are of three genera and four species. The golden eagle (*Aquila chrysaëtus*), distinguished from all the rest by its completely feathered shank, is the same as the European; so is the white-tailed sea-eagle (*Haliaëtus albicilla*), a mere straggler to Greenland; the white-headed eagle (*H. leucocephalus*), also known as the "bald eagle" and "bird of Washington," is a distinct species, peculiar to this country. Its great changes of plumage and the variability in size have given rise to the impression that there are several species; but, aside from the straggling *H. albicilla* and the South American harpy (*Thrasyaëtus harpyia*), which scarcely reaches Texas, only two eagles are known to occur in North America. They are easily distinguished by the naked yellow shank of *H. leucocephalus* as compared with the feathered shank of *Aquila chrysaëtus.*

34. *Strigidæ:* owls. A large cosmopolitan family of some 175 species, fairly represented by 27 species or sub-species of 11 genera; but the proportion of peculiar forms is rather small. The large cat owls are several varieties of *Bubo virginianus.* The little screech owls are several varieties of *Scops asio* and one or two other species. Other "eared" owls are the long-eared (*Asio wilsonianus*), distinct from that of Europe, and the short-eared (*A. accipitrinus*), common to many countries. The gray wood owls, with smooth heads, are the enormous *Strix cinerea*, the barred owl (*S. nebulosa*), and their respective varieties, with the peculiar *S. occidentalis* of Western North America. The snowy owl (*Nyctea scandiaca*) is a circumpolar species; the hawk owl (*Surnia funerea*) is the same as that of the Old World, or scarcely different. The saw-whet or Acadian owl (*Nyctala acadica*) is a common species, much smaller than its congener (*N. tengmalmi richardsoni*), but still surpassing in size the curious pygmy owls of the West (*Glaucidium gnoma* and *G. ferrugineum*); while more diminutive yet is the elf owl (*Micrathene whitneyi*), no larger than a sparrow. The burrowing owls of the Western prairies and of Florida are varieties of the South American *Speotyto cunicularia.*

35. *Aluconidæ:* barn owls. (See ALUCONIDÆ.)

Psittaci.

36. *Psittacidæ:* parrots. The families of psittacine

birds are not well established. There are some 350 species of the order; North America is as poor as possible in these birds, having but one, the Carolina paroquet (*Conurus carolinensis*), and that apparently doomed to extermination.

Picariæ.

37. *Picidæ:* woodpeckers. A nearly cosmopolitan family of great extent, having some 300 species. Though only 29 of these, of 10 genera, are North American, the ratio of peculiar or characteristic species is high, woodpeckers being among the most sedentary, and therefore locally distributed, of birds. Most of these species, and some of the genera, are not found elsewhere. The largest species is the ivory-billed (*Campephilus principalis*) of the Southern States; the next in size is the pileated (*Hylotomus pileatus*) of very general dispersion in wooded areas of the continent. Many of the species fall in the extensive genus *Picus*, common to the Old World, though these species are all characteristic of North America. The best known are the hairy (*P. villosus*) and downy (*P. pubescens*), with their respective varieties; the red-cockaded (*P. borealis*) is confined to the South, and the ladder-backs (*P. scalaris* et varr.) to the South-west, where also a Mexican species (*P. stricklandi*) reaches our border. The white-headed (*Xenopicus albolarvatus*) is a genus and species peculiar to the West, as is also the singular Lewis's woodpecker (*Asyndesmus torquatus*). Another beautiful and remarkable genus is *Sphyropicus*, comprehending the abundant yellow-bellied woodpecker (*S. varius*) and its Western varieties, together with the brown-headed (*S. thyroides*). *Melanerpes* and *Centurus* are two handsome genera, not confined to North America, the former giving us the gaudy tricolor or red-headed woodpecker (*M. erythrocephalus*) so plentiful in the East, the latter the red-bellied (*C. carolinus*), and each having other species in the West (*M. formicivorus, C. aurifrons, C. uropygialis*). Finally, the golden woodpeckers (*Colaptes*) are of several species, the common Eastern flicker (*C. auratus*) being replaced in the West by the red-shafted (*C. mexicanus*) and the gilded (*C. chrysoides*).

38. *Cuculidæ.* (See CUCKOO.)

39. *Alcedinidæ:* kingfishers. (See ALCEDINIDÆ.)

40. *Trogonidæ:* trogons. A single species (*Trogon ambiguus*) barely touches our border, out of some 40 of these brilliant birds which inhabit tropical America and warm parts of the Old World.

41. *Trochilidæ:* humming-birds. Though the single hummer of the Eastern States, the common ruby-throat (*Trochilus colubris*), long almost the only one known to inhabit this country, is now ascertained to be accompanied into North America by no fewer than 14 other species of 9 genera, the whole list is still small in comparison with the 400 species of 100 genera which inhabit other parts of America. All our other species but the one named are confined to the West, and most of them to the South-west; one, however, the rufous hummer (*Selasphorus rufus*), reaches Alaska. The others are *Trochilus alexandri, Selasphorus alleni, S. platycercus, Calypte anna, C. costæ, Atthis heloisæ, Stellula calliope, Calothorax lucifer, Amazilia fuscocaudata, A. cerviniventris, Iache latirostris, Basilinna xantusi, Eugenes fulgens.*

42. *Cypselidæ:* swifts. A moderate group of about 50 species, nearly cosmopolitan, represented by 4 species of 3 genera. The common chimney swift or chimney swallow of the East (*Chætura pelasgica*) has a Western congener (*C. vauxi*); the others are the cloud swift (*Nephœcetes niger borealis*) and rock swift (*Panyptila saxatilis*). The two principal divisions of the family are, however, represented by these generic types.

43. *Caprimulgidæ:* goatsuckers. Larger than the last, and equally cosmopolitan, represented in equal ratio by eight species of four genera, representing two of the divisions of the family. The whip-poor-will and chuck-will's-widow (*Antrostomus vociferus* and *A. carolinensis*) are typical *Caprimulginæ*, the former quite widely distributed in the Eastern United States, the latter confined to the South. Nuttall's whip-poor-will (*Phalænoptilus nuttalli*) represents the same group in the West, and another larger species of South America (*Nyctidromus albicollis*) reaches Texas. Another section of the family is illustrated by the abundant night-hawks or "bull-bats" (*Chordeiles popetue* and its varieties) of most of North America, with a smaller species in the South-west (*C. acutipennis texensis*).

Passeres (Clamatores).

44. *Tyrannidæ:* flycatchers. These offer a case like that of the hummers, there being a considerable representation by 11 genera and 31 species; nevertheless, a small one in comparison with the multitude of *Tyrannidæ* in warmer parts of America (70 genera, 300 species, or thereabouts). The tropical character of the whole group is witnessed in the fact that 6 of the genera and 12 of the species only reach our southern border or a little beyond. Those which are barely North American are the Derby (*Pitangus derbianus*), sulphur-belly (*Myiodynastes luteiventris*), fork-tail (*Milvulus tyrannus*), gray tyrant (*Tyrannus dominicensis*), Couch's tyrant (*T. melancholicus couchi*), rufous-tail crested (*Myiarchus erythrocercus*), Lawrence's crested (*M. lawrencii*), beardless (*Ornithium imberbe*), and vermilion (*Pyrocephalus rubineus mexicanus*). Others, pushing farther or more numerously, are the swallow-tail (*Milvulus forficatus*), Cassin's tyrant (*Tyrannus vociferans*), ash-throated crested (*Myiarchus cinerescens*), black pewit (*Sayiornis nigricans*), Coues's pewee (*Contopus pertinax*), and the buff-breasted (*Metrephanes fulvifrons pallescens*). The widely-distributed genera are only *Tyrannus, Myiarchus, Sayiornis, Contopus*, and *Empidonax*, all of which reach the British border, but scarcely go beyond this. Abundant species in the East are the kingbird (*Tyrannus carolinensis*), great crested (*Myiarchus crinitus*), pewit (*Sayiornis fusca*), great pewee (*Contopus borealis*), wood pewee (*C. virens*), and four species of little flycatchers (*Empidonax acadicus, trailli, minimus*, and *flaviventris*). The corresponding Western ones are *Tyrannus verticalis, Sayiornis sayi, Contopus virens richardsoni, Empidonax trailli pusillus, E. flaviventris difficilis, E. hammondi, E. obscurus.*

Passeres (Oscines).

45. *Sturnidæ:* starlings. Old World, the European starling (*Sturnus vulgaris*) barely straggling to Greenland.

46. *Corvidæ:* crows and jays. (See CROW.)

47. *Icteridæ:* American starlings, blackbirds, orioles, etc. A large family (25 genera, 100 species), confined to America, where it replaces, and to some extent represents, the Old-World *Sturnidæ*; fully illustrated by its North American 8 genera and 27 species. Here belong the familiar bobolink or reedbird (*Dolichonyx oryzivorus*); the notorious cowbirds (*Molothrus ater, M. ater obscurus, M. æneus*), parasitic upon other birds like the Old-World cuckoos; the swarming blackbirds of the genera *Agelæus, Scolecophagus*, and *Quiscalus*, as the red-shouldered marsh blackbirds (*A. phœniceus, A. p. gubernator, A. tricolor*), rusty and blue-headed grakles (*S. ferrugineus, S. cyanocephalus*), crow blackbirds (*Q. purpureus*), boat-tailed and great-tailed grakles (*Q. major, Q. macrurus*), and the yellow-headed blackbird (*Xanthocephalus icterocephalus*). One or another of these birds is extremely abundant in any part of the United States, and scarcely less numerous are the meadow starlings or "field-larks" (*Sturnella magna* and its varieties). The extensive genus *Icterus* comprehends the orioles, noted alike for their beauty of plumage and skill in weaving hanging purse-like nests. The Baltimore and orchard orioles (*I. galbula, I. spurius*) are the best known of these, but various others occurs in the South and West (*I. bullocki, cucullatus, parisorum*, and *melanocephalus auduboni*).

48. *Fringillidæ:* finches, buntings, sparrows, gros-

beaks, etc. One of the very largest families of birds (some 500 species), and much the most extensive of any North American family, having 37 genera and 123 species or sub-species. Notwithstanding this large number, the forms are so variously interrelated that no satisfactory subdivision of the family has been effected. A fair proportion of the genera and species are characteristic or entirely peculiar. Excepting a few of the boreal ones, the current genera are altogether different from those of the Old World. The snow bunting (*Plectrophanes nivalis*), Lapland longspur (*Centrophanes lapponicus*), pine grosbeak (*Pinicola enucleator*), and the red-polls (*Ægiothus linaria, A. l. holbœlli, A. hornemanni, A. exilipes*), appear to be identical in both hemispheres. There are distinct additional species of *Centrophanes* (*C. ornatus, C. pictus*). The characteristic Old-World genus *Pyrrhula* (bullfinch) appears as a straggler in Alaska. The common red crossbill (*Loxia curvirostra*) is represented in America by a variety or two (*L. c. americana* and *mexicana*) and a white-winged species, quite distinct (*L. leucoptera*); the Old-World hawfinch (*Coccothraustes*) by the generically different evening grosbeak (*Hesperophona vespertina*); the extensive genus *Carpodacus* by several distinct species of purple finches (*C. purpureus, C. cassini, C. frontalis*); the genus *Montifringilla* is replaced by *Rhynchophanes* (*R. maccowni*); the European siskin (*Chrysomitris spinus*) by the pine siskin (*C. pinus*); the European goldfinch (*Carduelis elegans*) by several American goldfinches, species of *Astragalinus* (*A. tristis, A. lawrencii, A. psaltria* and its varieties, *A. notatus*). The rose-finches are several species of the peculiar genus *Leucosticte* (*L. tephrocotis, L. griseinucha*, etc.), confined to the West and North-west. All the small spotted and streaked sparrows are generically distinct from any of Europe. These are very numerous. The leading forms are: the savanna sparrows (*Passerculus savana, P. bairdi, P. rostratus*, and others); the grass sparrows (*Poœcetes gramineus*); the grasshopper sparrows (*Coturniculus passerinus, C. henslowi, C. lecontii*); the marsh sparrows (*Ammodramus caudacutus, A. maritimus*); numerous song sparrows (*Melospiza fasciata* and its varieties, *M. palustris, M. lincolni*); summer sparrows, confined to the South and West (*Peucæa æstivalis, P. cassini, P. ruficeps, P. carpalis*); sage sparrows (*Amphispiza bilineata, A. belli*); snow sparrows (*Junco hiemalis* and numerous Western conspecies); chipping sparrows (*Spizella domestica, S. agrestis, S. monticola*, and three or four others); the large handsome crown sparrows (*Zonotrichia leucophrys, Z. albicollis, Z. querula*, and others); the lark sparrow (*Chondestes grammica*); and, finally, the large fox sparrows (*Passerella iliaca* and several other varieties). The lark bunting (*Calamospiza bicolor*) is a notable Western form, curiously resembling the bobolink in some respects. The black-throated bunting (*Spiza americana*) is a near relative of a European genus. The grosbeaks are the large and very beautiful rose-breasted (*Zamelodia ludoviciana*) and black-headed (*Z. melanocephala*), with the related blue species (*Guiraca cœrulea*) of more southerly distribution. The elegant painted finches are the nonpareil (*Passerina ciris*), the versicolor (*P. versicolor*), the indigo (*P. cyanea*), and the lazuli (*P. amœna*). Two tiny finches barely reach North America from warmer countries (*Spermophila moreleti* and *Phonipara zena*). The large cardinals are of two genera (*Cardinalis* and *Pyrrhuloxia*), being respectively the Virginian and Texan redbirds. The most extensive genus is *Pipilo*, comprehending the well-known towhee bunting of the Eastern United States (*P. erythrophthalmus*) and several Western conspecies, with a group of other species confined to the West, as *P. fuscus* in its several varieties, *P. aberti*, and *P. chlorurus*, to which the green finch (*Embernagra rufivirgata*) of Texas is related. This completes an enumeration of all the genera and most of the species; few of the former are absolutely confined to North America, but all have characteristic species, and the whole series is apart from Old-World relatives, excepting in the cases noted. Two European species (*Passer domesticus* and *P. montanus*) have very foolishly and unfortunately been imported and naturalized in North America.

49. *Laniidæ:* shrikes. A mere fragment of this large family of over 100 species, there being but two species of the leading genus, *Lanius*. These are the Northern butcher-bird (*L. borealis*) and the Southern loggerhead (*L. ludovicianus*), with its conspecies (*L. l. excubitorides*).

50. *Vireonidæ:* greenlets. A rather small group of exclusively American birds, about one-fourth of them represented in North America by 15 or 16 species of the genus *Vireo* and its subdivisions, the missing genera being *Hylophilus*, *Vireolanius*, *Neochlœ*, and *Laletes*. The leading species are the red-eyed (*V. olivaceus*), white-eyed (*V. noveboracensis*), warbling (*V. gilvus*), yellow-throated (*V. flavifrons*), and blue-headed (*V. solitarius*), all of the Eastern States, with corresponding species in the West, among them the isolated *V. atricapillus*.

51. *Ampelidæ.* (See AMPELIDÆ and WAXWING.)

52. *Hirundinidæ:* swallows. Rather poorly represented by only 7 species out of some 75 of this cosmopolitan family; but all the species are abundant and characteristic, and furnish as many generic types. They are the barn swallow (*Hirundo erythrogastra horreorum*), shared with South America and very near the European species; the white-bellied (*Iridoprocne bicolor*), a peculiar North American type; the violet green (*Tachycineta thalassina*), American; the cliff (*Petrochelidon lunifrons*); the bank (*Cotile riparia*), common to both hemispheres; the rough-winged (*Stelgidopteryx serripennis*), and the purple martin (*Progne subis*), both American.

53. *Tanagridæ:* tanagers. Out of the 40 genera and 300 species of this great tropical American family of brilliant birds we have but a single outlying genus with 4 species, none proceeding beyond the British border. These are the scarlet tanager (*P. rubra*), the rose (*P. æstiva*), the hepatic (*P. hepatica*), and the crimson-headed (*P. ludoviciana*), equally apportioned between the East and the West.

54. *Cœrebidæ:* honey-creepers. One stray species in Florida (*Certhiola bahamensis*) from this small family of tropical American and especially West Indian birds.

55. *Sylvicolidæ:* American warblers. This is preeminently the characteristic family of North America, where a majority of the 100 species and all but two or three of the genera occur. The principal missing genus (*Basileuterus*, of 20 species) doubtless actually touches the Rio Grande, and *Granatellus* and *Teretistris* are but small genera, related to *Icteria* (below); while the only North American genera which have more species elsewhere are *Geothlypis* and *Setophaga*. There are in North America 62 species of 14 genera, and the two leading genera, *Helminthophila* and *Dendrœca*, have scarcely any species elsewhere. The family represents in America the Old-World *Sylviidæ*. (*a*) The yellow-breasted chat (*Icteria virens*), with its two exotic allied genera above named, represents one section of the family (*Icteriinæ*). (*b*) The flycatching warblers (of the genera *Myiodioctes*, *Cardellina*, and *Setophaga*) are the most southerly in their relationships, most of the extralimital species belonging to this section (*Setophaginæ*). The redstart (*Setophaga ruticilla*) and three species of *Myiodioctes* (*M. mitratus, M. pusillus, M. canadensis*) are very generally distributed in North America, while *Setophaga picta* and *Cardellina rubrifrons* only reach our southern border. (*c*) The beautiful genus *Dendrœca* leads among the wood warblers proper (*Sylvicolinæ*) with 23 species and two or three sub-species, these being a large majority of all that are known to exist. The summer warbler (*D. æstiva*) represents a small section of the genus which has several tropical conspecies. The black-throated green (*D. virens*) has several related species in the West. Other abundant Eastern species

are the black-throated blue (*D. cærulescens*), with its Western correlative the black-throated gray (*D. nigrescens*): the yellow-rump (*D. coronata*), with its companion species *D. auduboni* in the West; the yellow-throat (*D. dominica*), similarly related to the Western *D. graciæ;* the cœrulean, Blackburnian, black-poll, bay-breasted, chestnut-sided, black-and-yellow, Cape May, prairie, red-poll, and pine-creeping (*DD. cærulea, blackburniæ, striata, castanea, pennsylvanica, maculosa, tigrina, discolor, palmarum, pinus*). The worm-eating warblers are eight species of the genus *Helminthophila*, of which the blue-winged yellow (*H. pinus*), blue golden-winged (*H. chrysoptera*), orange-crowned (*H. celata*), Nashville (*H. ruficapilla*), and Tennessee (*H. peregrina*) are the leading ones, together with *Helmintherus vermivorus* and another species of that genus, and the prothonotary warbler (*Protonotaria citrea*). The creeping warblers are the black-and-white (*Mniotilta varia*) and the blue yellow-backed (*Parula americana*), with another species of the latter genus just reaching Texas (*P. nigrilora*). Finally, the ground warblers include three species of *Geothlypis*, the Maryland yellow-throat (*G. trichas*), mourning warbler (*G. philadelphia*) and its Western congener (*G. macgillivrayi*), with the Connecticut and Kentucky warblers (*Oporornis agilis, O. formosa*) and three species of *Siurus*, the golden-crowned (*S. auricapillus*), water (*S. nævius*), and Louisiana (*S. motacilla*).

56. *Motacillidæ:* wagtails and pipits. Nearly cosmopolitan, but chiefly Old World, very sparingly represented in either America. Our species of wagtail proper are Old World, being only the white (*Motacilla alba, M. ocularis*), astray from Europe or Asia, and the yellow (*Budytes flavus*), of circumpolar distribution, common in Alaska. Our pipits are one stray from Europe (*Anthus pratensis*), the abundant American titlark (*A. ludovicianus*), and the Missouri titlark (*Neocorys spraguii*), the latter a peculiar American type. There are really but two properly North American forms of this group, and scarcely more in other parts of America, out of some 75 species in all.

57. *Alaudidæ:* larks. (See ALAUDIDÆ.)

58. *Troglodytidæ:* wrens. A considerable group, chiefly American, but so badly put together that its limits are uncertain. As commonly accepted it focuses in Middle America, where occur many species of *Campylorhynchus, Thryothorus*, etc. Two species of the former (*C. brunneicapillus, C. couesi*), with the rock wren (*Salpinctes obsoletus*) and cañon wren (*Catherpes mexicanus* and its varieties), are confined to the Southwest; while of the latter genus, the great Carolina wren (*Thryothorus ludovicianus*) and Bewick's (*T. bewicki*) are more widely distributed in the United States. Other and more typical wrens of North America are the house wren (*Troglodytes domesticus*), long- and short-billed marsh wrens (*Telmatodytes palustris, Cistothorus stellaris*), and the winter wren (*Anorthura troglodytes hiemalis*). These occur each under several geographical races, and the last named, with its Alaskan conspecies (*A. t. alascensis*), is scarcely different from the common wren of Europe, etc.

59. *Certhiidæ:* creepers. (See CERTHIIDÆ.)

60. *Sittidæ:* nuthatches. Another small group, only represented in America by one genus, *Sitta;* there are four North American species—white-bellied (*S. carolinensis* and *S. c. aculeata*), red-bellied (*S. canadensis*), brown-headed (*S. pusilla*), and pygmy (*S. pygmæa*).

61. *Paridæ:* titmice. A rather large family, mostly of the Northern hemisphere, and in the Western practically confined to North America, where 17 species or sub-species of 4 genera occur. One species of *Lophophanes* (*L. wollweberi*) is very near the European, but the other crested titmice are more distinct (*L. bicolor, atrocristatus, inornatus*). The central genus, *Parus*, absorbs most of the species; the leading ones are the black-capped chickadee (*P. atricapillus*), near the European; the white-browed (*P. montanus*); the chestnut-backed (*P. rufescens*); the Hudsonian (*P. hudsonicus*); and the Siberian (*P. cinctus*), an Alaskan form identical with that of Asia. There are three species of the Western and Mexican genus *Psaltriparus*—the least bush-tit (*P. minimus*), the plumbeous (*P. plumbeus*), and black-eared (*P. melanotis*). This is a peculiar American type, as is also *Auriparus*, with its single species (*A. flaviceps*).

62. *Chamæidæ:* wren-tits. One genus and species (*Chamæa fasciata*), peculiar to California. (See above.)

63. *Turdidæ:* thrushes, warblers, etc., etc. The thrushes proper are a great cosmopolitan family of some 200 species, and from these it has not proven practicable to disengage the enormous assemblage of some 600 species of Old-World warblers, commonly called *Sylviidæ*. (*a*) The latter only occur, in their typical manifestation, in the New World by two boreal species, *Phylloscopus borealis* and *Cyanecula suecica*, which straggle to Alaska. (*b*) But near or among them stand the kinglets (*Regulus*), of which North America has two distinct species, the ruby-crown (*R. calendula*) and the gold crest (*R. satrapa*). (*c*) Nor will violence be done by considering the isolated American genus *Polioptila* in this connection. Most of its species belong to Middle America, but the blue-gray gnatcatcher (*P. cærulea*) and two others inhabit North America. (*d*) The aquatic dippers are represented by a single peculiar species of the wide-ranging genus *Cinclus* (*C. mexicanus*) of the Rocky Mountains. (*e*) The large Old-World group of chats has a straggling species in this country, the stone chat (*Saxicola œnanthe*), but is chiefly represented by the beautiful blue-birds of the genus *Sialia*, peculiar to America, of three species—the Eastern (*S. sialis*), Mexican (*S. mexicana*), and Arctic (*S. arctica*). (*f*) The exclusively American group of the mocking thrushes (*Miminæ*) is generally brought into this connection, though their true relationships may be elsewhere. These abound in the warmer parts of America, and are fairly numerous in the United States. The mountain mocker (*Oroscoptes montanus*) is peculiarly North American; the famous mocking-bird and homely cat-bird (*Mimus polyglottus, M. carolinensis*) are characteristic of the same country, where also occur nearly all the numerous species of thrashers. One of these is common in the United States at large, the brown thrasher (*Harporhynchus rufus*); the others are confined to the Southwest (*H. rufus longirostris, H. curvirostris, H. c. palmeri, H. bendirii, H. cinereus, H. redivivus, H. r. lecontii, H. crissalis*). (*g*) Typical thrushes of North America are all of the single wide-ranging and comprehensive genus *Turdus;* there are 13 characteristic species and their varieties, the leading ones being—the wood-thrush (*T. mustelinus*), the veery (*T. fuscescens*), the hermit (*T. unalascæ*), the olive-back (*T. ustulatus*), together with the common robin (*T. migratorius*) and Oregon robin (*T. nævius*). The European redwing (*T. iliacus*) also occurs, but only as a straggler to Greenland; the rest are characteristic American species.

For economic relations of North American birds see art. AGRICULTURE (AMERICAN). The principal systematic treatises since the Audubonian period are: Cassin's *Illust. B. Cala.*, etc., 1 vol. 8vo, 1853–55; Brewer's *N. Am. Oöl.*, 1 vol. 4to, 1857; Baird, Cassin, and Lawrence's *B. N. Am.*, 1 vol. 4to, 1858 (vol. ix. *Pacific R. R. Rep.*, and later eds., with atlas of 100 plates); Baird's *Birds Mex. Bound. Surv.*, 1 vol. 4to, 1859; Baird's *Rev. Am. B.*, 1 vol. 8vo, 1864–66; Elliot's *B. of N. Am.*, 2 vols. fol., 1866–69; Samuels' *B. N. Engl.*, 1 vol. 8vo, 1867, and later eds.; Cooper's *Ornith. Cala.*, ed. Baird, 1 vol. 8vo, 1870; Coues's *Key N. A. Birds*, 1 vol. 8vo, 1872; Baird, Brewer, and Ridgway's *Hist. N. A. B.*, 3 vols. sm. 4to, 1874; Coues's *Birds North-w.*, 1 vol. 8vo, 1874; Henshaw's *Ornith. Wheeler's Expl.*, 1 vol. 4to, 1875; Minot's *Land and Game B. of N. Engl.*, 1 vol. 8vo, 1877; Gentry's *Life-hist. B. E. Penna.*, 2 vols. 8vo, 1876–77; Jasper's *B. of N. Am.*, 1 vol. fol., 1874–78; Maynard's *B. of E. U. S.*, 1 vol. 4to, 1872–78; Merriam's *Rev. B. Conn.*, 1 vol. 8vo, 1877; Coues's *B. Colorado Vall.*, part i., 1 vol. 8vo, 1878; Marsh's *Odontornithes*, 1 vol. fol., 1880; Jones and Shulze's

Ill. Nests and Eggs of B. of Ohio, fol., 1878 *et seq.*; Stearns' *N. Engl. Bird-life*, ed. Coues, 2 vols. 8vo, 1881–83; Wheaton's *B. of Ohio*, 1 vol. 8vo, 1882. The *Bull. Nuttall Club*, ed. Allen, 8 vols. 8vo, 1876–83, is mainly devoted to North American birds. See also various papers in *Proc. Phila. Acad.*, *Proc. Boston Soc. Nat. Hist.*, *Proc. Essex Inst.*, *Proc. U. S. Nat. Mus.*, *Bull. Mus. Comp. Zool.*, *Bull. U. S. Geol. Surv.*, *Ann. N. Y. Lyc. Nat. Hist.*, *Am. Journ. Sci.*, and elsewhere, by Allen, Baird, Brewer, Brewster, Cassin, Cope, Coues, Henshaw, Lawrence, Marsh, Ridgway, and others. (E. C.)

BIRMINGHAM, a manufacturing borough of New Haven co., Conn., is at the junction of the Housatonic and Naugatuck Rivers, 10 miles W. of New Haven. It is on the Naugatuck Railroad and the New Haven and Derby Railroad. Across the Naugatuck River is an iron bridge 350 feet long, and across the Housatonic a wooden bridge 700 feet long. There are three hotels, a national bank, another bank, a weekly newspaper, five churches, and good schools. It has also woollen-mills, a cotton-mill, paper-mills, a rolling-mill, iron- and brass-foundries, a machine-shop, manufactories of silver-plated ware, corset steels, skates, pins, tacks, corsets, furniture, toys, carriage hardware, bolts, organs, etc. The town is lighted with gas, and has a park and water-works. Its property is valued at $8,000,000, and its public debt is $9000. In 1868 a dam costing $700,000 was built across the Housatonic. Birmingham was incorporated in 1853. Population, 3026.

BIRNEY, DAVID BELL (1825–1864), an American major-general, was born at Huntsville, Ala., May 29, 1825. He was the fourth son of James G. Birney, who removed to the North in 1834 and became the most prominent leader of the anti-slavery political movement. After receiving a liberal education, partly at Phillips Academy, Andover, Mass., David, at the age of eighteen, entered into mercantile life at Cincinnati. Meeting with some reverses, he removed to Upper Saginaw, Mich., where he studied law and was admitted to the bar. In 1848 he became connected with a law and collection agency at Philadelphia, and conducted an extensive business till the outbreak of the Rebellion. He had in the mean time been an officer in a Philadelphia militia regiment, and, full of ardor for the Union cause, he served with his regiment under Gen. Robert Patterson in Virginia. When the first brief term of enlistment expired he raised the Twenty-third Pennsylvania volunteers, a regiment of fifteen companies, and was appointed its colonel. He reached Washington Aug. 22, 1861, and the good discipline and effectiveness of his troops attracted the attention of Pres. Lincoln. Birney, having been appointed brigadier-general in Feb., 1862, served under Gen. McClellan in the Peninsular campaign. His courage, readiness of resource, presence of mind in danger, and military skill were recognized at the battles of Williamsburg, Fair Oaks, and Seven Pines, and his services were highly commended by the gallant Gen. Philip Kearney. During Gen. Pope's campaign in the latter part of the summer of 1862, Gen. Birney was distinguished in the second battle of Bull Run (Aug. 30), and especially at Chantilly (Sept. 1), where with seven regiments he checked a Confederate force before which a division had retired. In this battle Gen. Kearney was killed, and Birney assumed command of his troops. In the disastrous battle at Fredericksburg (Dec. 13, 1862) he repulsed with great slaughter an attack on the left wing of the Union army. At Chancellorsville (May 2, 1863), when a large part of the enemy was interposed between his division and the main body of the army, he cut his way through, bringing with him a captured Confederate brigade. For his gallantry on this occasion he was afterwards promoted major-general. At Gettysburg (July 2, 1863) he held an exposed position on the Union left, and by his stubborn resistance to Longstreet's attack saved the army from being overwhelmed, though at the loss of half his corps. He continued to be conspicuous in various engagements of the Army of the Potomac, generally retaining under his command the regiments with which he had been associated from the first. He was appointed to the command of the Tenth army corps July 23, 1864, and fought with his usual gallantry under Gen. Grant in the Wilderness and the subsequent operations of the army in the advance on Richmond until a few days before his death. Stricken down with malarial fever, he was brought to his home in Philadelphia, where he died Oct. 18, 1864.

BIRNEY, JAMES GILLESPIE (1792–1857), a distinguished opponent of slavery, was born at Danville, Ky., Feb. 4, 1792. He graduated at Princeton in 1812, studied law at Philadelphia with A. J. Dallas, and went to Kentucky, where he was elected to the legislature. In 1825 he removed to Huntsville, Ala., practised law, and became district attorney and member of the legislature. In 1833 he took part in organizing a branch of the Colonization Society. The next year he returned to Kentucky, and became professor in the university at Danville. Here also he organized a colonization society, and was made its president, but soon after published a letter advocating the immediate emancipation of the slaves, and at the same time set free his own, twenty in number. Finding it impossible to get a printer for anti-slavery publications in Kentucky, he removed to Cincinnati, where he published *The Philanthropist*, one of the earliest papers to urge the abolition of slavery. The office in which it was printed was several times attacked by mobs and wholly or partially destroyed. In 1836 he was appointed secretary of the American Anti-slavery Society, and went to reside in New York, devoting himself vigorously to its work. He was prominent in organizing the Liberty party, by which he was nominated for the Presidency in 1840 during his absence in England. In 1842 he removed to Saginaw, Mich., and was again nominated for the Presidency in 1844. He received over 62,000 votes in thirteen States, and his candidacy deprived Henry Clay of the electoral votes of New York and Michigan, thereby securing the election of Polk. He was soon after disabled by a fall from his horse, and took no further part in public affairs. He died at Perth Amboy, N. J., Nov. 25, 1857.

BISCACHA, BISCACHO, or VISCACHA, a South American quadruped of the family *Chinchillidæ*, order *Rodentia*; the *Lagostromus trichodactylus*. Though related to the active and graceful chinchilla, it is a heavy-bodied fossorial animal, living in burrows underground, and bearing the same relation to the chinchilla that the prairie-dog of North America (*Cynomys ludovicianus*) sustains to the true arboreal squirrels; its general economy is the same as that of the prairie-dog. The biscacha inhabits the Pampas in vast numbers, being one of the most abundant and characteristic animals of the open country east of the Andes, which is in some places completely undermined with its burrows; these are also occupied in many cases by a kind of owl (*Speotyto cunicularia*). The limbs are strong, the hinder somewhat elongated; the fore feet four-toed, the hind feet three-toed; the longest claws are nearly an inch; the ears are of moderate length; the tail rather long, about half the length of the body, bushy, but naked and callous underneath for a space, being that applied to the ground when the creature sits erect on its hind quarters, as is its constant habit. The length of its head and body is from 18 to 24 inches; of the tail, including the hairs, 8½ to 10½. The color is dark gray above, pencilled with black, white or yellowish-white below; the tail colored to correspond; the head several times banded with black and white. The dental formula of the genus is as in other *Chinchillidæ* and nearly throughout the hystricine series of rodents (*m.* $\frac{4-4}{4-4}$); the enamel-folds divide the grinders into transverse laminæ, of which there are two to each tooth, excepting the back upper molar, with three. The closest relationships are with the genus *Lagidium*. (E. C.)

BISCHOFF, THEODOR LUDWIG WILHELM VON, a distinguished German biologist and embryologist, was born at Hanover, Oct. 28, 1807. He was a son of

Christian Heinrich Ernst Bischoff (1781–1861), an eminent writer on therapeutics. The younger Bischoff was educated at Düsseldorf, Heidelberg, Bonn, and Berlin; received the doctor's degree in 1832; became professor of anatomy at Boon, 1836; of physiology, 1843; and in 1844 was made a professor at Giessen. In 1855 he removed to Munich and became professor of anatomy and physiology. He resigned this position in 1878. Among his many important works are—*Beweis der von der Begattung unabhängigen periodischen Reifung und Loslösung der Eier des Säugethiere und der Menschen* (1844); very important memoirs on the development of the rabbit (1842), the dog (1845), the Guinea-pig (1852), the roe-deer (1854), and various apes (1867 and 1870); *Der Harnstoff als Mass des Stoffwechsels* (1853); and *Die Grosshirnwindungen des Menschen mit Berücksichtigung ihrer Entwickelung bei dem Fötus und ihrer Anordnung bei den Affen* (1866). His scientific writings are mostly records of his own minute, laborious, and accurate researches, and present many original and interesting views. Even those papers which have now become antiquated are often important as waymarks in the history of science.

BISMARCK, the capital of Dakota and of Burleigh county, is on the Missouri, at the crossing of the Northern Pacific Railroad, 420 miles W. N. W. of St. Paul. The river is here crossed by a splendid bridge. Bismarck has a fine court-house, two banks, good hotels, churches, and public schools, and a daily and a weekly newspaper. It was settled in 1873, and is now the headquarters for five lines of steamboats comprising twenty-eight boats, and is the gateway to the mining and grazing country of Montana. Its population in 1880 numbered 1758, and is rapidly increasing. It was chosen as the Territorial capital in 1883.

BISMARCK, Otto Eduard Leopold, Prince, chancellor of the German empire, was born April 1, 1815, in the village of Schönhausen, in the district of Magdeburg, where his father, Karl Wilhelm von Bismarck, owned an estate. On his father's side the family, although of but moderate means, traced its descent from the nobles of the Mark. His mother was the daughter of Privy-councillor Mencken, grandson and great-grandson of the two Leipsic scholars who published the *Acta Eruditorum*. Bismarck's first experience of school-life was at the Plamann boarding-school at Berlin, and his recollection of the rigid discipline there enforced is far from pleasant. Thence he went to live with Prof. Bonnell, and after that continued his studies in the Friedrich Wilhelm Gymnasium, and still later at the Graue Kloster School. In 1830 (at Eastertide) he entered the University of Göttingen, with the intention of devoting himself to judicial studies. Although he evinced greater delight in the gayeties of student-life, with its drinking-bouts and duels, than in his books or in attending the lectures of the professors, he was nevertheless able to pass a successful examination in 1835. After practising for a short time in the city courts of Berlin, and later in those of Aachen and Potsdam, in the mean while serving for one year as a volunteer in the rifles, he entered the agricultural academy at Eldena, near Greifswald, where, in company with his brother, he prepared himself to assume charge of the family estates in Pomerania. He entered on this charge in 1839, and for the next five years resided on one of these estates, named Kiephof. His eccentric behavior, coupled with his utter disregard of etiquette, gained him the name of "the mad Junker," and he was so unsuccessful that he at one time thought of removing with what still remained of his fortune and settling as a farmer in the Polish forests. In the mean while, his youthful ardor having gradually spent itself, he devoted much time to reading, historical works especially, and interested himself in political affairs, evincing somewhat liberal views. At his father's death he became owner of the estate at Schönhausen, whither he removed in 1845. Shortly afterward he accepted the position of inspector of dykes along the river Elbe, and was appointed a delegate to the assembly of the Prussian province of Saxony, in which capacity in 1847 he became a member of the first Landtag (general parliament) of the kingdom of Prussia. The *doctrinaire* utterances of the Liberal majority were so little in accord with his views that he soon attached himself to the conservative side, which speedily learned to regard him as a powerful and talented leader. His speeches voiced the feeling of nationality which had inspired him while yet a student. He repeatedly spoke in opposition to the demand of the Liberals for the extension of parliamentary rights, and in the debates on the emancipation of the Jews he strenuously maintained the opinion that Prussia must preserve its character as a Christian state. In July, 1847, shortly after the adjournment of the Landtag, he married Johanna von Puttkamer, the daughter of a Pomeranian landed proprietor. She bore him three children, one daughter and two sons.

Bismarck was not in accord with the turn given to Prussian affairs by the events of 1848. When, on the 2d of April, the Parliament voted an address to the king thanking him for the measures of reform he had granted, although the vote was almost unanimous Bismarck opposed the motion, saying that he could not lie, and would not pretend to rejoice at entering upon a course which he believed to be wrong. At a later day, when preparations for the Prussian advance upon Schleswig-Holstein were under consideration, he spoke of the "Phaëthon flights of Prussian policy," and at about the same time he drew attention to the dangerous concessions that the Government had made to the Poles in Posen. With the state of feeling of the majority of Germans of that day it was not surprising that he failed to secure an election either to the Prussian Parliament or to the National German Assembly. It was not until 1849, when the reaction had set in, that he was chosen a deputy to the Landtag that was to meet at Berlin. While there he firmly opposed the democratic party, and antagonized all attempts of the Government to effect a more perfect union between the members of the so-called Alliance of the Three Kings (*Dreikönigsbundniss*). In his speech of Sept. 6, 1849, he answered the question, "What would Frederick the Great have done after the break-up of the Frankfort constitution?" as follows: "He would either have come to an understanding with Austria, and have played the brilliant *rôle* afterward enacted by the emperor of Russia, or" (and here we may note the germ of the policy of 1866), "at the risk of being obliged to throw the sword into the balance, he would, after declining the imperial crown, have ordained what form the German constitution must take." In the Erfurt Parliament he opposed the constitution submitted by the Government, for the reason that it was not sufficiently Prussian in character. In the Parliament of 1850 he advocated an alliance between Prussia and Austria.

His views on this point underwent a complete change after he was appointed, Aug. 18, 1851, to represent Prussia in the Federal Diet. The king regarded him as the man who could best bring about a renewal of friendly relations with Austria, and Bismarck repaired to Frankfort in the firm conviction that Prussia should act in accord with Austria, and, if necessary, even subordinate herself to that power. His official intercourse while at the German Diet with the representatives of the emperor Francis Joseph seriously weakened this conviction; and the mission to Vienna, whither the king sent him in the summer of 1852 in order that he might bring about a definite understanding with the Austrian Cabinet, satisfied him that the result desired could not be accomplished in that way. Prince Schwarzenberg was dead, but his saying, "*Il faut avilir la Prusse et après la demolir*," was still the guiding principle of the leading circles in Austria, and was at every turn so plainly manifest in the behavior of the Austrian representatives at Frankfort that Bismarck's kindly feeling towards Austria at last changed into one of aversion.

When war between Austria and Piedmont became imminent, Bismarck saw in it a favorable opportunity for Prussia to free herself from subjection to the policy dictated at Vienna, and thought it advisable to assist Italy, or, at all events, to remain neutral during the conflict. He expressed these views in Frankfort as well as in Berlin. Current opinion was largely in sympathy with Austria, and, deferring to this feeling, it was thought inexpedient that one holding such views as Bismarck did should remain a delegate to the Diet. He was therefore transferred to St. Petersburg, going thither March 5, 1859. He was favorably received by the emperor Alexander, and his relations with Prince Gortschakoff were of a friendly character, thus enabling him to strengthen the traditional good understanding between the courts of Prussia and Russia, and to render possible the friendly neutrality observed by Russia during the wars of 1866 and 1870. During his stay at St. Petersburg he gave much thought to the thorough change in the relations of Prussia to Austria and the idea of reorganizing Germany into a confederation under the leadership of Prussia. In a letter of May 12, 1859, to Minister von Schleinitz, we find him already fully convinced that a rupture with Austria would not be a misfortune, but a healthy crisis, and that Prussia's connection with the Germanic Confederation was an evil to be cured by means of blood and fire. In a letter to his wife, July 20th of the same year, he thus laments: "Our policy is gradually gliding more and more into the Austrian slack-water; as soon as we fire our first shot by the Rhine the Austro-Italian war will be at an end, and a Franco-Prussian war will be next in order, in which Austria, having been relieved of her burden, will assist us or not just as far as her own interests may dictate." In a similar strain he had before that written to a Prussian diplomat: "We are sacrificing ourselves to Austria; we are taking the war off her hands, giving her a chance to breathe again; and will she so employ her freedom as to help us to a brilliant *rôle?* Will she not, on the contrary, use every effort to subordinate both the nature and the amount of our successes to her own interests?" In those days he was charged, both in diplomatic circles and by the public press, with endeavoring to bring about an alliance between France, Russia, and Prussia, the objects of which were the aggrandizement of France by the addition of Belgium, the extension of the Russian borders to the Vistula, and the absorption by Prussia of the smaller German states. Alluding to this slander, he wrote on June 16, 1860, to a diplomat: "My cherished political ideas were, last spring, so carefully sifted at court and by the minister that they knew full well that I look to the uprising of the nation as our only strength and defence. If I am possessed by a demon, it is a Teutonic, and not a Gallic, one." In another letter, dated Aug. 22, he writes in a similar strain: "During my stay in Germany I never counselled dependence on aught save ourselves and the national strength of the Germans that would offer itself in case of war." His views as to organizing this force are given in a letter from Stolpemunde, Sept. 18, 1861, in which he observes: "We need a closer consolidation of the German means of defence, a new and more flexible adjustment of the customs department, and a number of national institutions calculated to protect the material interests against the disadvantages caused by the unnatural configuration of the interior boundaries of the German states. I do not see why the idea of national representation, either by means of a diet or a customs parliament, need so affright us."

As early as 1860 rumors were rife that Bismarck was to be appointed minister. In the autumn of 1861 he submitted his programme to the king at Baden-Baden. The latter hesitated as to concurring with it, and on the 26th of May, 1862, sent Bismarck as ambassador to Paris. But by the middle of September he was recalled to Berlin, and on the 24th he was appointed minister of state and provisional president of the council of ministers. His first task was to end the conflict between the Parliament and the Government, and to carry the measures for army reform which had caused the conflict. He endeavored at first to effect this by gentle means, and explained his ideas of nationality to the prominent members of the opposition, but encountered only unconquerable distrust. They saw in him only the arrogant Junker; they did not care to understand him, or even think it worth while to have aught to do with him. The conciliatory manner in which he met the house of delegates, his promise to withdraw the rejected budget for 1863, and to submit in the next session, with the estimates, a sketch of a law carrying out the measures for military reform, all were in vain. In vain, too, did he assure them that the Government desired peace, and that to exert an influence in national politics it was necessary that the army be increased. The legal and professional wisdom of the Liberals whom he addressed thought itself better informed, and believed that the proper course was to achieve moral conquests in Germany by means of liberal measures. It was of no avail that Bismarck answered that Germany looked less to the principles of liberalism than to the power of Prussia, and that the questions of the day were not to be solved by speeches and resolutions, but by blood and iron. Their small minds failed to understand the genius who opened the great outlook to them, and thought only of their right to vote the supplies. Bismarck's declaration that he would postpone submitting the estimates until the excitement had subsided seemed to them, in their blindness, merely a subterfuge to enable him to carry out his measures for military reform without submitting a budget. The house of delegates insisted that the estimates should be laid before them at once, adding that if no agreement was arrived at, the expenditure of items that had not been passed would be held as a violation of the constitution. Bismarck made no further attempts at conciliation, and the Parliament was prorogued. On the 8th of October, Bismarck was appointed president of the ministry of state and minister for foreign affairs. His endeavors to effect an arrangement with Austria bore no fruit. In January of 1863 he submitted to Karolyi, the Austrian ambassador at Berlin, the following: "For the future Austria will act equally and jointly with Prussia in the direction of German affairs, or she may expect an open rupture. Attempts by means of resolutions of the Federal Diet to constrain Prussia to acquiesce in measures opposed to her interests can only result in a dissolution of the federation and in placing Prussia in an inimical position towards Austria." Count Rechberg, the Austrian foreign minister, replied that if Prussia should during the next European conflict side with the enemies of Austria, public opinion in Germany would condemn such a course, and the march of events would confirm that judgment.

Bismarck's address at the opening of Parliament, Jan. 10, 1863, was again conciliatory in tone, but the opposition obstinately insisted on its narrow policy, and met the announcement of the new laws in relation to the military service and the revenue by charging the ministry with an infraction of the constitution in applying public moneys to purposes for which there had been no appropriation. At this Bismarck changed his tone, and on the 27th of January answered to the effect that controversies which cannot be settled by compromise become questions of strength, and that those who possess the power would then proceed according to their understanding of the matter. After this and other occurrences had contributed to the acrimony of the contest the majority passed an address to the king requesting the dismissal of the ministers. The petition was not acceded to, and Parliament was prorogued before it had an opportunity to take up the estimates. In June following a rigid edict against the public press added to the excitement on the part of the Liberals. In the opinion of the leading politicians of Vienna, Prussia had fallen so low in the eyes of Germany that it seemed possible to deprive her of the leadership in German affairs, and the emperor Francis Joseph now issued an invitation to the members of the federation to meet on the 16th of August in order to consider a new constitution for Germany. Yielding to Bismarck's advice, the king did not attend the conference. At the personal solicitation of the king of Saxony he was about to reconsider this resolve when Bismarck, renewing his arguments, at last persuaded him to remain firm. Unless Prussia took part in the conference the realization of Austria's plans was impossible. Bismarck's great service lay in thus rendering abortive the attempt to inveigle Prussia into accepting a subordinate position. In the Schleswig-Holstein question, which, through the death of the king of Denmark, assumed great importance, he did the state even greater service. It was with truth that in 1877 he remarked to the writer of this article, "That is the diplomatic campaign of which I am proudest." His plan, as announced by him to the council of state at the outset, was to unite the duchies to Prussia, and was opposed by nearly all powers and parties. From the start he held fast by the London protocol, although public sentiment was opposed to him in this; and he succeeding in preventing any harm from Austria's and England's inclination to side with the Danes. Seizing a favorable moment, and still basing his claims on the London protocol, he succeeded in inducing Austria to take part in the attack upon Denmark, thus separating Austria from the states of Middle Germany, who supported the cause of an independent duke of Schleswig-Holstein as that of a confederate in separatism. When Austria, recognizing her mistake, set about arranging for an understanding with the states of Middle Germany in opposition to Prussia, Bismarck was for deciding the question by an immediate appeal to arms; but the king's assent was withheld, and then followed the Gastein Treaty, which served to postpone the issue. Convinced that the German question could only be settled by warlike methods, and that the issue could not be long delayed, Bismarck's only serious concern was as to the attitude France would maintain in the event of war between Prussia and Austria. To satisfy himself on that score, he visited the emperor Napoleon, with whom he had interviews in Paris and at Biarritz in the autumn of 1865. The emperor, hoping that the Prussian arms would be unsuccessful, promised to remain neutral, but hinted that if Prussia should prove the victor substantial evidence of her gratitude would be due to France for the territorial advantages thus secured by Prussia. The charge that Bismarck thereupon engaged to cede the left bank of the Rhine to the emperor of the French is a base slander. On that and subsequent occasions he, however, allowed Napoleon to deceive himself with the idea that such a proof of gratitude was possible.

At home, also, the opposition of the Liberals to what they termed "a fratricidal war" against Austria was voiced in hundreds of resolutions and addresses, but was of little more weight than the absurd opposition to Bismarck's policy that was manifested in the duchies beyond the Elbe. Of greater importance was the feeling of the king, who, influenced by the ladies of the court, began to entertain grave doubts as to the policy of entering on this war. The king's feelings were, however, completely changed after Carl Cohen's unsuccessful attempt, on the 7th of May, 1866, to assassinate Bismarck. The almost miraculous escape of Bismarck encouraged both the king and the minister in the conviction that they were in the right path, and that they were the chosen instruments of Providence in carrying out their plans. Some time previously (March 24) Bismarck had sent a circular letter to the German Governments, in which he dwelt on the instability of the existing relations between the German states, and requested a direct answer to the question as to whether they would assist Prussia if attacked by Austria. On the 9th of April the gauntlet was thrown down to Austria by Bismarck's requesting the convocation of a German Parliament, on the basis of universal and direct suffrage, at Frankfort. On June 10 he submitted the draft of a new constitution for Germany, and four days later Austria attempted to use the majority of the Diet in order to force Prussia to abandon her position. Thereupon King Wilhelm felt himself obliged to declare war against Austria, Bismarck's skilful moves having placed Prussia in the attitude of the attacked party battling in defence of the right. Although nearly all of the more important German states sided with Austria, and despite the comparatively slight assistance rendered by Italy—which power Bismarck had in the mean while induced to become an ally of Prussia—the military genius of Von Moltke and the excellence of the Prussian army enabled Prussia to end the two years' war with a brilliant victory. And now diplomacy again entered upon the scene; but, although Prussia was in a trying position, the pen did not undo the achievements of the sword. France offered to act as mediator, and as Bismarck thought moderation advisable he urged the king to accept the proffered mediation. Napoleon further demanded that the Prussian hegemony over the Germany of the future should be restricted to the states north of the river Main. As the adhesion of the South German states to the North German Union was merely a question of time, this demand was, on Bismarck's recommendation, also acquiesced in. Finally, when it came to annexing states, they were spared; in return for which they were obliged secretly to pledge themselves to assist Prussia with their armies in the event of an attack on the part of France. On the other hand, Hanover and the duchy of Nassau were united to Prussia, and with the acquisition of Nassau, Frankfort, and Schleswig-Holstein, Prussia had become a power that, in conjunction with the other states of the North German Confederation, would have been able to defend Germany against the attack of any foreign enemy. Although King Wilhelm desired the acquisition of Lusatia, Saxony was spared, out of consideration for the expressed wish of the emperor Francis Joseph. Bismarck advised against the absorption of any portion of Austrian territory, for, as he looked forward to a restored understanding with that empire, he desired to avoid giving offence. He contented himself with breaking up the union between Austria and Germany, a step of great value to the healthy development of the latter.

It now remained to provide a constitution for the North German Confederation, and in this Bismarck kept two points in view. In the constituent parliament he expressed himself in favor of a responsible ministry and direct universal suffrage. In the first place, as the creator of the new Germany, he desired to be solely responsible for its further development. At the same time, he desired to avoid any arrangement looking to such centralization as might prove objectionable to the various princes composing the confederation or would cause the South German states to hold aloof from the North German Union. By favoring direct universal suffrage he desired to afford a proof of the justice and liberality of his feelings towards the lower classes. The Prussian system of three classes had resulted in the election of deputies who had for years been bitterly opposed to the Government. It was felt that the dangers incident to universal suffrage would be counterbalanced by the want of parliamentary routine on the part of the delegates thus elected, and the real effect of the extension of the suffrage would, it was hoped, be to avoid an otherwise alarming gathering of Socialistic elements in the Parliament.

The most important foreign issue that engaged Bismarck after the founding of the North German Confederation was the Luxemburg question. Had he at that time accepted the challenge of France, South Germany would have come to his aid in repelling the emperor's attack on the integrity of Germany; nor was France then as well prepared for war as in 1870. On the other hand, Luxemburg had left the old Germanic

Confederation, but had not entered the new union. Moreover, outside of Prussia the reorganization of the German military system was by no means completed. Lastly, by contenting himself with the declaration of the neutrality of Luxemburg, and its ceasing to be a fortified place, the chancellor of the empire proved to the world that his policy was a peaceful one. After Benedetti submitted Napoleon's well-known proposal to him, and when the French minister's conference with the emperor Francis Joseph at Salzburg clearly showed that he was endeavoring to effect an alliance inimical to Prussia, Bismarck could the less deceive himself as to the likelihood of a lasting peace with France. The chancellor met this intrigue by a bold stroke of diplomacy. In a circular despatch of Sept. 7, 1867, he declared that the German nation would not submit to interference or guidance on the part of any foreign power.

The German Zollverein Parliament assembled in the spring of 1868. It was the realization of an old ideal of Bismarck's, and an attempt to draw North and South Germany together by the bond of mutual interest, and thus to counterpoise the efforts of the Particularists, as manifested in Bavaria and Würtemberg after the Salzburg conference. The carrying out of the idea was not according to his wishes or the hopes of Nationalist parties. The manœuvres of the South German Particularists had the result of weakening the action of the Zollverein Parliament, and the force of mutual material interests was not as potent as had been expected. At the same time, the impatience of the patriots who hoped Bismarck would adopt other measures for the abolition of the Main boundary and the bringing together of the South and the North, and would even, if necessary, employ a certain degree of coercion, grew very high. The chancellor regarded such a course as impolitic and dangerous, and had repeatedly expressed himself to that effect in the Parliament; for instance, in the spring of 1870, when Lasker characterized the admission of Baden to the North German Union as a patriotic duty, since it was a case in which both the Government and the great majority of the people desired the step. Two years previously the chancellor had proclaimed to the world that an appeal to Germany's fear of foreign powers was useless, and there was therefore no use in now reminding him of the need of caution because of the power of France. He really hoped that the constitutional development that France was about entering upon might bring about a state of affairs that would render a foreign war much more difficult, if not impossible, and felt that such development would be hindered if, by acceding to the wishes of Baden, public opinion in France became irritated. He desired the admission of South Germany to the North German Confederation, but he wanted her to come in as a whole, not in separate states; and least of all Baden, for he felt that her admission might be regarded as exerting a pressure on Würtemberg and Bavaria. The result to be brought about by the working together of the parties of Nationalist views was to be the voluntary offer to join with North Germany. Above all, France was to be afforded no opportunity to claim that North Germany had furnished a *casus belli* by infringing the treaty of 1866.

A few months later the Chauvinist party in France (with whom went hand in hand the Ultramontanes, who were countenanced by the empress, and who were the sworn enemies of now mighty Prussia) found the long-sought-for pretext for war in the candidacy of the hereditary prince of Hohenzollern for the Spanish throne; and now that Bismarck saw that, in spite of all moderation, war could be no longer delayed, and after Benedetti had, to the intense indignation of all Germany, endeavored to humiliate King Wilhelm, the German chancellor hastened the course of affairs by urging, and then making public, the rebuke to Benedetti. There is reason to believe that Grammont's conduct in this affair was just what the chancellor desired, for if France was bent on having war with Germany, it was to the advantage of the latter that Napoleon should find the cause in a question of dynasty in which the other powers felt but slight interest. A skilful move on the part of Bismarck, tending completely to isolate France, was to publish the various attempts on the part of Napoleon during past years to enlist Prussia in a war of conquest. These revelations appeared in the *Times*, and were on the 29th of July, 1870, supplemented by a circular despatch sent to diplomatic representatives of the North German Confederation. In this despatch the chancellor stated that he had never had the slightest doubt as to the impossibility of entering into the proposed plans, but that, in the interest of peace, he had thought it advisable to allow the French statesmen to deceive themselves as long as possible with the belief that France might be aggrandized by the annexation of Belgium and certain strips of German territory. To dispel their hopes would have brought about immediate conflict, and, although he knew that war was inevitable, he thought it nevertheless advisable to put it off as long as possible. Furthermore, he had thought it possible that such changes might be introduced in the constitution and policy of France as would do away with the necessity for war. For this reason he had treated Benedetti's proposals in a dilatory manner. These revelations were not without great influence, especially in England, where at first there was no lack of sympathy with France. After the German victories at Wörth and Saarbrücken, Austria and Italy lost what desire they may have had to unite with France against Germany; and if at Vienna there still lingered a desire to attack the Germans in the rear, the result of Bismarck's stay at St. Petersburg and the recollection of his conduct during the Polish rebellion of 1863 was that Russia would not quietly look on during such an attack. During the campaign in France, Bismarck accompanied the king as councillor and diplomatic mediator, in which capacity he exercised an important influence in the direction of affairs. In his circular letters of Sept. 13th and 16th, and in various publications in the journals, he announced the important principle that Germany could not conclude peace until she had material guarantees against future attacks on the part of France, and that, therefore, the boundary-line of South Germany must, for her protection, be removed farther to the west, so as to include the French fortifications which had hitherto threatened Germany. At the same time, the state papers referred to declared that, as Germany had been obliged to wage war single-handed with France, she insisted upon the right of settling her account with that nation without interference on the part of any of the neutral powers.

The preliminaries to the Peace of Versailles were Bismarck's work, and so, too, was the definitive treaty of peace signed on the 10th of May, 1871, in the negotiation of which Bismarck well knew how to expedite the labors of the hesitating French statesmen. Finally, he directed the negotiations that followed between the South German states and the North German Confederation, and which led to the forming of the German empire. Throughout the affair he evinced great tact in his treatment of the king of Bavaria, and again showed the justice and moderation of his views.

In 1867 the Parliament had voted Bismarck a gift in money, with which he purchased the estate of Varzin in Pomerania; on the 22d of March, 1871, he was made an hereditary prince, and in June of the same year the king presented him with the Saxon forests in Lauenburg.

Since the establishment of the German empire Prince Bismarck has taken a decisive part on all questions of importance. It was founded according to his plans, built up as he proposed, and under his intelligent guidance it has exercised a directing influence on the European powers which must be termed beneficent, since it aimed at the preservation of peace, and, when it failed of that, at all events prevented the battle that had been provoked from becoming a general war. He was especially solicitous about the assimilation of Alsace and Lorraine, which provinces, after their cession by France, he had made the property of the whole German empire, instead of claiming them for Prussia alone, and had thus made them a bond of union for all Germany, and especially the states of the South. A second problem that presented itself was the maintenance of the power of the Government as against the demands of the Roman *Curia* for joint rule. These demands assumed a more dangerous shape than ever before through the Syllabus and the declaration on the part of the Vatican in 1870 of the doctrine of papal infallibility, and were dangerously reinforced through the formation of a clerical party in the German and Prussian parliaments. He had repeatedly and unambiguously defined his position on this question, but had never lost sight of the fairness and moderation that always characterize him. He was the prime mover of rigid laws in defence of the rights of the state against the presumption and insubordination of bishops and priests, but he was also the first to offer to bring about an understanding with the Prussian Catholics and to ask for a modification of those laws, since he had never opposed the religion of the Catholics, but only their position of antagonism to the state. The first instance of this occurred Jan. 30, 1872, in the Prussian Parliament, when, in reply to Windhorst's complaint of the slight put upon the Catholics, he stated that the formation of a Catholic party, the so-called Centre, was in effect "preparing to move against the state." In the session of February he called attention to the fact that, while there were no anti-national elements among the French or Polish clergy, the German Catholic clergy were in league with the Polish nobles in opposition to the German element. It was only in Germany that the Catholic clergy maintained an anti-national character; it was only there that the interests of the Church lay nearer their hearts than did those of the nation. He was especially severe in the session of March 10, 1873, when the church laws were under consideration in the upper house, saying that the papacy had always been a political power, and that, just as the French had always looked forward to the acquisition of the Rhine boundary as their ideal, so the programme of the papal party had always included subordinating the temporal power to the clerical. He held, however, that it was the duty of the state to use all means that it could command in defence of its authority and its rights. On the 20th of April he again repeated this opinion, declaring that it was not for him to attempt to settle religious disputes, and that if there was a dispute he had entered it under the firm conviction that the fault did not lie with the Catholic Church, but with that party within the Church who sought to secure to themselves temporal power, and whose movements were so inimical to the safety of the state that he could no longer take the responsibility of silently looking on. As this party opposed the very constitution of the nation, it was the duty of all who desired to strengthen the state to oppose it. At Kissingen, on the 13th of July, 1874, Kullmann, a cooper's apprentice, attempted to kill Bismarck, "because of the church laws." The event had just as little effect in frightening Bismarck from his course as had the threats of Ultramontane orators and journalists. To the people of Kissingen, who had waited upon him and had held a torchlight procession in his honor, he said, "The great work will not be prevented by such measures; the power of the united German nation will carry it to a successful issue."

On the 5th of Feb., 1875, the pope issued his encyclical letter declaring the church laws, based on the new order of things, invalid. The chancellor of the empire answered by submitting the draft of new laws to Parliament, in pursuance of which laws Government pay was to be withheld from insubordinate Catholic clergymen, the religious orders were to be abolished, and the articles of the constitution relating to the Church were to be changed. All of these laws, and several others of a like character, were sanctioned by Parliament and the emperor, despite the intrigues of certain parties at court, at the head of whom was the empress Augusta, whose leanings were towards Ultramontanism.

These and previously enacted laws prevented the Ultramontanes from taking an aggressive part against the state, but did not interfere with their passive resistance. Bishops declared that their obedience was due to God rather than to man, and that, therefore, they could not recognize the new laws; their example was followed by hundreds of priests and thousands of the laity. The unyielding bishops were deposed, the clergy went unpaid, and the congregations, deprived both of sermon and pastoral care, degenerated. Before long there were over one thousand vacant pulpits; a similar state of affairs obtained in the Catholic faculties, and in many schools religious instruction had of necessity ceased. It was greatly to be desired that such a condition of affairs should speedily end.

Add to this the troubles in the Federal Parliament, nearly one-fourth of the members of which belonged to the clerical party and voted as a unit against all measures proposed by the Government. This would not have mattered had the Government been able to count on the support of the other sections. But such was not the case. Even the Conservatives failed him on some questions; the party of progress opposed him in nearly every instance, and the strongest party, the National Liberals, were too uncertain to be counted upon. The left wing of the latter party consisted in the main of *doctrinaires*, popular favorites unfamiliar with public affairs, lawyers, and professors—all of whom were more concerned about parliamentary rules than anxious to aid the cause of national unity by strengthening the hands of the chancellor. They were, indeed, little better than the party of progress, who since 1865 had learned nothing and forgotten nothing. Thus, Bismarck frequently found it difficult, and sometimes impossible, to secure a majority in favor of his projects. The National Liberals could only be gained over by concessions of further parliamentary privileges, and the clerical party by yielding to the *Curia*. In either direction the chancellor could not go beyond a certain limit without injury to the state. He therefore endeavored to gain his end by compromises. During the lifetime of Pope Pius, who was entirely under the control of the Jesuits, there was no reason to hope for peace between the *Curia* and the Centre. Under his successor, Leo XIII., there seemed to be a prospect of establishing a *modus vivendi*, securing, on the one hand, the rights of the state, and, on the other, a less rigorous administration of the laws of 1873. Negotiations begun in the summer of 1878, which seemed for a while to promise a happy issue, failed because the new pope pitched his demands in too high a key. The chancellor, however, responded by asking Parliament for leave to modify the enforcement of the May laws in case the *Curia* should show a desire for reconciliation. After a severe struggle the powers asked for were in part granted, the pope seemed willing to come to an agreement, negotiations were resumed, and, in 1882, Bismarck submitted to Parliament the plan of a law by which the May laws were again modified, and in pursuance of which, even if the demands of the Centre were not all accorded, the condition of the Prussian Catholics was much improved. Prussia's representation at the Vatican, which had ceased during the time of Pius IX., was renewed during that year. But in taking this course the chancellor had no intention to abolish the church laws of 1873. At a parliamentary conference on the 4th of May, 1879, he said: "We shall lay down our weapons on the field of battle, but we shall not surrender them.

We shall now secure peace, but the time may soon come when we shall need our weapons." He did not regard the peace as a definitive settlement of the conflict (for this, owing to the character of the *Curia*, was barely possible); his efforts were directed to bringing about a peaceful relationship, not to be formulated by treaty, but to be rendered enduring by the spirit of mutual concession.

Conflicts with Parliament and with his Prussian colleagues, unpleasant relations in the Diet, and, above all, the continued intrigues of the opposition at court, seriously interfered with the chancellor's labors, and induced him on several occasions (in 1874, 1877, and 1880) to ask the emperor to relieve him of his office. The emperor, in common with all discerning citizens, realized how impossible it would be to grant his request, and so, despite his failing health, the chancellor was obliged, like another Atlas, to continue to bear his burden.

In 1874 the obstinacy of the National Liberals and of the party of progress threatened a dangerous conflict, which Bismarck averted by counselling the emperor to compromise. The alarming growth of the Social Democrats, threatening to bring about chaos, suggested repressive measures to the chancellor. The Liberals, however, would not listen to this, but favored gentle reformatory measures, and rejected Bismarck's proposed law against the Socialists, as submitted by him after Hödel's attempt on the emperor's life, May 23, 1878. When, shortly after that, Nobiling's attempt at assassination followed, Parliament was prorogued, and the new elections resulted in the return of a majority that enabled the chancellor to procure the passage of laws which for some years protected society against "banditti."

One of the important economic questions that interested Prince Bismarck was that of making the railways the property of the state. The plan of making all the railways of Germany the property of the empire at first encountered the opposition of the separate states. Bismarck was therefore obliged, at the start, to content himself with acquiring the principal roads of Prussia for that state, and to trust to the influence of her example upon the policy of her neighbor states. He was opposed by the free-traders, who were averse to Government interference with economic affairs, and also by the Liberal party, who feared that the increase in the number of Government officials would endanger the purity of the elections. He succeeded, however, in carrying his point, and the financial result fully justified the measure. He also addressed himself to reforming the system of duties and taxation, especially the removal of the contributions which the various states were obliged to pay to the empire; the abolition of direct taxes, with the exception of the income-tax on the wealthy classes, raising the revenue, as far as possible, by means of indirect taxes; and the establishing of a tariff system which should protect the industries of the nation against those of countries more favorably situated. He indicated these reforms in the Federal Parliament as early as Nov. 22, 1875, and again, on the 22d of Feb., 1878, using these words: "My ideal is not an empire that is obliged to gather contributions at the gates of the separate states, but an empire which, as it is the main support of a sound system of finance by which it controls the indirect taxes, is enabled to contribute funds to the several states; and I feel that the path of reform will lead us to that goal." In a letter bearing date Dec. 15, 1878, and addressed to the Federal Council, he explains his proposed tariff reforms and further plans, saying, "I regard the reduction of the burden of direct taxation, by increasing the number of sources of revenue that are based on indirect taxes, as a financial reform of paramount importance. It is not the result of mere chance that other great states raise their revenues principally from duties and other indirect taxes. A direct tax, due by the individual for a certain fixed amount, and payment of which can be enforced, is more oppressive than an indirect tax, the amount of which is regulated by the general consumption of the articles taxed, and which, as far as the individual consumer is concerned, is included in the price of the goods used by him. In the greater portion of Germany direct taxes and communal dues have become onerous, and the middle classes are the greatest sufferers . . . This reform is also intended to secure a revision of the tariff, not merely by increasing the duties on certain articles, but by returning to the principle of the Prussian tariff law of 1818—*i. e.*, that all foreign goods entering the state are dutiable." The exceptions were to be raw materials indispensable in manufactures and not produced in Germany, or, if produced there, insufficient as to quantity or inferior in quality. A tariff law based on these principles was submitted to the Federal Parliament, Feb. 12, 1879. The Liberals, who were, for the greater part, free-traders, opposed it; the Conservatives favored it; and as the members of the Centre, who represented the manufacturing districts, and therefore desired a protective tariff, came to their aid, the law was passed. The duty on foreign grain was at the same time increased. By this measure Bismarck proposed to remove a portion of the direct taxes, that bore heavily on the agricultural classes, from the interior to tha frontier. The question as to what constitutional guarantees should be asked for because of the increase in the tariff had proved a difficult one while the law was under consideration. The Centre proposed that if the revenue from the customs and the tobacco-tax exceeded 130,000,000 marks, the surplus should be divided among the various states in proportion to their respective contributions to the empire; the National Liberals proposed that the duty on coffee and salt should be fixed annually in the Government estimates, and that any surplus should be apportioned among the states according to population. While the chancellor disapproved of both plans, there was no room for doubt as to which of the two was the lesser evil. The second project would obviate the necessity of state contributions to the general Government, but would, at the same time, make the most important imposts depend on the annual action of the imperial Parliament. In the first plan these taxes were all definitely fixed, and the retention of the state contributions to the imperial treasury was a mere matter of bookkeeping. On this occasion the chancellor delivered a characteristic speech, in the course of which he declared that he would continue to the end in the course that he deemed most advantageous to the fatherland. Whether it brought him love or hatred, it mattered not to him. From the beginning he had known but one guiding star: By what means could he unite Germany? and, that accomplished, how could he strengthen, foster, and develop that union, in order that, with all elements mutually contributing to the result, it should endure? On his return from the campaign of 1865 it would have been easy for him to enforce a severe reactionary policy, but he had not done so. "I demanded indemnity," he went on to say. "Was it because of love for constitutionalism? I shall not claim to be better than I am. That was not the reason. I am not opposed to the constitution; I regard it as the only practicable form of government. But had I believed that a dictatorship or absolutism in Prussia would have been of greater service in forwarding the unification of Germany, I should have advised absolutism."

In order to carry out his plans for economic reforms, the chancellor, who had in 1881 accepted the ministry of commerce, founded the Prussian council of finance, an institution which he endeavored, unsuccessfully, to induce the empire to adopt. Its functions were to examine all laws bearing on economic subjects before they were submitted to the Prussian imperial Parliament. The most important measure laid before this body was that for the establishment of Government insurance for the protection of certain classes of the laboring population against casualties incident to their avocations. The law grew out of the ideas of the Socialists, and it was hoped that it would serve as a counterpoise to the agitation carried on by the Social Democrats. The leaders of the latter party had always described the Government as the hard-hearted ruler who provided only for the wealthy and the office-holding class, but had no care for the workingman. At last it was to be shown that the Government was kindly disposed towards the laborer, who would better serve his own interests by relying on the protection of the state than by favoring the chaos which the Socialists were endeavoring to bring about. The party of progress opposed the scheme as "a communistic plan of the worst kind;" the rest of the Liberals were, nearly all of them, opposed to it; so, too, were the clerical party; and when submitted to the imperial Parliament it failed to become a law. In vain did the chancellor, on the 2d of April, 1881, declare that "The attempt of the Government to secure to the unfortunate workingman better and worthier treatment in the future than had been accorded him in the past, so that he might not seem to his healthy comrades like an old mare that had been turned out to starve, could surely not be termed Socialistic in the same sense as the word was used when applied to the band of murderers who have lately been described to us. If it be necessary to find a name for our efforts, there is one which I will cheerfully accept—practical Christianity; and this, too, *sans phrase*, for we do not mean to put off the people with fine words, but to do good to them." The emperor adopted the idea, and embodied it in his message of the autumn of 1881, and the chancellor is so firmly convinced of the utility of his plan that he will again propose it—if necessary, in a somewhat modified form—and will continue to do so until both the law for the accident-insurance system and that for insurance for old age are adopted. The untoward result of the elections of 1881 did not in the slightest affect his purpose in regard to the plan of life insurance or as to the proposed Government monopoly of tobacco; the proceeds of the latter are to be devoted to ameliorating the condition of the working classes. He has thus earned the right to be regarded as the "advocate of the poor man," in which capacity he has repeatedly acted and spoken on other questions.

In his foreign policy, in which he displayed great statesmanship and astuteness, his chief aim being the preservation of the peace of Europe, he was more successful than in his home policy, for in the latter his efforts were frequently thwarted by the ill-will of the clerical party and the perverseness of the *doctrinaire* Liberals. By forming foreign alliances for Germany, in order thus to circumvent French plans for a war of revenge, he served the cause of peace. Already during the Franco-Prussian War, first at Rheims and later at Versailles, Bismarck sent word to Count Beust, chancellor of the Austrian empire, that newly-founded Germany desired to enter into friendly relations with Austria-Hungary. Beust, however, seemed indifferent to the matter, and it was only with his successor, Andrássy, who appeared to have a clearer idea of the real interests of the dual empire on the Danube, that Bismarck succeeded in bringing about an understanding. After the success of this attempt Bismarck proposed to himself to effect the reconciliation of Austria and Russia, the relations between those two powers having been somewhat strained ever since the Crimean War. The result of this effort appeared in the meeting of the three emperors in Sept., 1872, and the alliance of the three Northern powers, which excited so potent an influence on the other powers that the wavering were attracted and the inimical were frightened off. One proof of this was the visit of the king of Italy to Berlin in 1873; another was the manner in which the French authorities proceeded with a newspaper that published a pastoral letter in which a bishop had denounced the German Government. The chancellor's opinion as to which form of government in France was most in accord with the interests of Germany and of universal peace was thus expressed in a despatch to Count Arnim, the German ambassador at Paris: "What we desire is that France leave us in peace, and that, if she proposes to make war on us, she may find no allies; as long as she is without these there is no danger. A French republic would find it difficult to gain the alliance of a monarchy, and for that reason I cannot counsel His Majesty to encourage the French monarchists, since that would only be aiding our enemies the Ultramontanes." A victory of the Legitimists seemed to give the prince cause for great concern. In a despatch of Jan., 1874, he emphasized the opinion that a clericalized France, subject to the Roman theocracy, would be repugnant to the peace of the world, and would of necessity be the sworn foe of Germany. He closed with these words: "We wish to live at peace with France. If, however, war becomes inevitable, the German Government could not answer for its conduct to its conscience or to the nation if it had waited for the moment most opportune to France."

In the various phases of the Eastern crisis the chancellor's efforts were directed to the preservation of peace, while at the same time he carefully refrained from offending Russia by preferring any such demands upon her as the English Government had requested the German Government to make. He did not regard it in the interest of Germany to prevent the war on the Balkan peninsula. He presided at the Congress of Berlin which succeeded the war, and at which the treaty of peace between all the great powers was drawn up. In this position he acquitted himself so skilfully that such difficulties as arose were speedily surmounted. Russia, however, had promised herself greater support of her claims on the part of Bismarck. The official press at St. Petersburg went so far as to speak of ingratitude because the abrogation at Berlin of certain important points of the Treaty of San Stefano had not been prevented, and because Austria was entrusted with the occupation of Bosnia and Herzegovina. The Panslavic journals declared that "the path to the conquest of Constantinople lies through Berlin." In Western Poland there was a massing of troops that seemed intended for an advance across the German frontier. In Paris, Gen. Obrutschew was feeling his way towards forming a Franco-Russian alliance against Germany. Against such confederates it was necessary that Germany should be well protected, and this end Bismarck achieved by carrying out his old-time plan—viz., the close alliance of Austria and Germany for mutual protection and defence. As he, at a later day, stated to the writer of this article, he even thought of "a public constitutional alliance as against a foreign coalition, which alliance, being founded on the mutual consent of its various factors, should be dissoluble only by their mutual consent." With the exception of the matter of publicity and the constitutional form the proposal was cheerfully approved by Andrássy, and later by the emperor Francis Joseph; and when, on the 25th of Sept., 1879, Bismarck left Vienna, the final negotiations had been effected and the affair seemed arranged to the satisfaction of all parties concerned. The emperor Wilhelm, moved by a feeling of kinship for his nephew, the Russian emperor, hesitated about signing the treaty, but withdrew his objections when the chancellor assured him that he would resign unless the treaty he had negotiated was agreed to. Thus was the treaty brought about. It may well be termed one of the greatest diplomatic triumphs of Prince Bismarck, and on the 12th of October last the English secretary for foreign affairs thus expressed himself in regard to it: "To all that desire the peace of Europe and the independence of the nations I would exclaim, 'The world has become a great gainer.'" In fact, a bulwark which has proved effectual even to this day had been erected against Panslavists of the class of Gen. Skobeleff, and also against the schemes of revenge that were nourished by the Gambettists—in this serving not only Germany and Austria, but the best interests of the civilized world. Bismarck's latest great move was his attitude towards the French expedition against Tunis, which he not only permitted, but encouraged. The newly-awakened French desire for foreign conquest thus found vent in a direction in which there was no danger to Germany, and at the same time served to estrange Italy, which Government has since that time shown a decided leaning in favor of allied Germany and Austria. The Porte has also sought to establish friendly relations in the same quarter. When, at the Dantzic conference, the present czar showed that Russia was prepared to strike out in a new direction, the chancellor offered the hand of reconciliation, and the pleasant relations then established have not been seriously threatened by the vaporings of Skobeleff.

Bismarck's greatness lies not only in his diplomatic genius and his energy, but in his moderation. He created the new Germany; he has known how to preserve it thus far, and how to secure its future by antagonizing that domestic enemy, destructive Liberalism.

Prince Bismarck is tall in stature and of an imposing presence; he has a piercing eye, and his countenance is expressive of great energy. He has always been a lover of nature, delighting in agriculture, and, until prevented by failing health in recent years, he was a bold rider and huntsman. In all of his family letters, and in many of his public and private utterances, there is a vein of healthy humor and many a genial, happy phrase. He is not a parliamentary orator with ready flow of language. He contemns phrases, and goes directly to the pith of the matter. As a result, it is more pleasant to read the reports of his speeches than to listen to them during delivery. In religion he is a believing Christian who finds in God the reasons for what he does and leaves undone, as well as strength in suffering. He has many admirers, but, although he can be very amiable, he possesses but few friends. Like other great men, of similar temperament, he stands alone. (M. B.)

BISONS, AMERICAN, living and extinct. Under the head of AUROCHS (*Bison bonasus*; which see) the genus *Bison* has already been distinguished from its allies, *Bos*, etc. The word "bison" is both the technical generic name and the proper English appellative of species of the genus. The living American species is universally but erroneously called the "buffalo," no other name being heard in the West. In addition to what is said under AUROCHS, it may be stated that the bisons proper differ from species of *Bos* in their slenderer limbs and less massiveness of the skeleton as a whole; in the proportions of the fore and hind quarters; in the length of the spines of the dorsal vertebræ; in the relative lengths of the fore and hind cannon-bones; in the crisp, curly hair, that of the fore parts especially lengthened, fringing the lip and bearding the chin, as well as forming a mat upon the forehead. There are three established North American species of *Bison*, two of them fossil, the third the "buffalo."

See Vol. III. p. 688 Am. ed. (p. 792 Edin. ed.).

1. *Extinct North American Bisons.*—The first indication of a fossil bison in America was afforded by a specimen from Big Bone Lick, Ky., described in 1803 by Rembrandt Peale—a mutilated cranium and horn-core, destined to become historical. This indicated a gigantic species, with a spread of horns of nearly twelve feet. It was regarded by Cuvier as identical with the fossil bison of Europe, which he did not distinguish from the aurochs, and received no distinctive name until 1825, when Harlan called it *Bos latifrons*. A second specimen, of the same gigantic proportions, was discovered in 1846 near San Felipe, Tex. In later years remains of fossil bisons were successively discovered near Natchez, Miss.; at the Brunswick Canal, Ga.; at the Lick in Kentucky; at Eschscholtz Bay, Alaska; Ashley River, S. C.; Pilarcitos Valley, Cal.; Luzerne co., Pa.; Jo Daviess co., Ill.; Tatlo River and the Yukon, Alaska; Adams co., Ohio. They represented the large species, *B. latifrons*, and a distinct smaller species, *B. antiquus*, Leidy. Both have had various names imposed upon them; those here given are adopted by Allen, who considers no more than these two species as established, though Leidy had previously recognized no fewer than five. They are elaborately described and figured by Allen in his splendid memoir (*Mem. Mus. Comp. Zool.*, iv., No. 10, Cambridge, 1876), to which the reader is referred. Remains of the existing species are also found fossil and sub-fossil over a wide area in North America.

2. *The Living American Bison or "Buffalo"* (*Bison Americanus*).—*a. General History.* The name "bison" is apparently of Teutonic origin, signifying originally some species of wild cattle (A.-S. *wesent*, Germ. *wisent* or *wisent*, Fr. or Lat. *bison*, Gr. *βίσων*). The American species was first formally named *Bos Americanus* by Gmelin in 1788, though both Catesby (1754) and Brisson (1755) had already called it *Bison Americanus*. It was the *cibola*, *bisonte*, or *armenta* of early Spanish, the *bœuf sauvage*, *vache sauvage*, *bison d' Amérique* of French writers. The earliest representation of the animal is said to be that given by Thevet in 1558, three years after the publication of Vaca's journal, which gave the earliest known description. De Laët gave another in 1633; others are given by Nuremburg in 1635 (*Taurus quivirensis*) and by Hernandez (*Taurus Mexicanus*) in 1651. Descriptions and figures multiplied during the remainder of the seventeenth century, but the first fair representations were those later made by F. Cuvier and Geoffroy. At present no animal is better known in its general aspects, and few if any figure more frequently in writings relating to North America.

b. Physical Characters. The full-grown bull is about nine feet long from the muzzle to the root of the tail. The height at the hump is five and a half to six feet; at the hips, scarcely or not five feet. The tail is about four feet long, including the hairs, which are a foot to one and a half feet beyond the vertebræ. The cow is much smaller—about six and a half feet long, standing four and a half feet high at the shoulders. The weight is estimated up to nearly 2000 pounds for the bull, 1200 for the cow. The head is apparently carried very low, but this appearance is partly due to the elevation of the hump, particularly in the males. The ferocious aspect is enhanced by the shagginess of the fore parts. Besides the growth of shaggy hair upon the fore parts generally, a great bunch falls over the forehead, sometimes so as to obscure the animal's vision; there is a long beard, and the hair between the fore legs sometimes sweeps the ground. The horns of the bull are very short, thick set, stout at base, rapidly tapering, and much curved forward. Those of the cow are about as long, but much slenderer and less curved. The color of the pelage varies greatly with age and season, but not with sex. Calves are at first quite reddish; afterwards darker brown, and then blackish; but the hair towards the period of its shed bleaches to a dingy grayish-brown. During the shedding, which occurs in midsummer, the hinder parts are for a time nearly or quite naked. The ordinary "robes," with the color and general appearance of which every one is familiar, are those of cows or young bulls, as the hide of the old bulls is too thick and heavy to be readily dressed. Melanistic and pied individuals occur, but rarely; perfect albinos are known, but a "white buffalo" is of exceeding rarity. Buffaloes long inhabiting other localities than the open plains, their natural homes, acquire distinguishable varietal characters. They are known as "wood-buffalo" and "mountain-buffalo." The former only occur northward of the Saskatchewan; a small herd of the latter still inhabits the densely-wooded mountains of Colorado, or did within five or six years. In some respects these varieties approach the aurochs more nearly than do the ordinary buffaloes of the Plains.

c. Geographical Distribution. For many years the range of the buffalo has steadily contracted from the immense area over which it formerly roamed, the Pacific Railroad finally cutting the range in two. According to Allen, the former habitat was as follows: East of the Mississippi, the northward extension was limited by the Great Lakes, and the eastern by the Alleghanies, in a general way, though herds wandered across these mountains into the Carolinas, where alone it is known to have occurred on the Atlantic water-shed. Immense herds inhabited the valleys of West Virginia and adjacent parts of Kentucky and Tennessee. To the southward it was unknown south of the Tennessee River. It ranged over parts of Arkansas and Texas, and across the Rio Grande into Mexico; westward over portions of New Mexico and thence north-west through the Great Salt Lake basin, probably to the Sierras Nevadas of California and the Blue Mountains of Oregon. In British America it appears to have been limited westward by the main chain of the Rocky Mountains; northward, to the north side of Great Slave Lake, in lat. 62° to 64°; eastward, not beyond the plains west of the Hudson's Bay highlands, whence southward it occupied the valleys of the Saskatchewan and its tributaries to Lake Winnipeg and the valley of the Red River of the North. In the north-west, again, it ranged over the head-waters of the Mississippi, east nearly to Lake Michigan, thence still east over Northern Indiana and along Lake Erie into Western Pennsylvania. It is not known to have occupied any portion of the old Canadian provinces. This range was prior to 1800. By 1800 the range had contracted on every side, the restriction from the maximum extent being especially notable from the eastward, the animal having retreated in the United States entirely west of the Mississippi, excepting small portions of Wisconsin and Minnesota; it scarcely reached anywhere south of the Rio Grande; the Rocky Mountain backbone more exactly limited it westward; in British America the restriction was less marked, but uniform for the whole contour of distribution. By 1825, while there had been little change in British America or in the north-western mountainous portions of the United States, the contraction was marked to the east, south, and south-west. The line eastward ran through Minnesota, Middle Iowa, Western Missouri, and Arkansas, into Texas, there entirely north of the Rio Grande; through a part of New Mexico, more of Colorado, a small part of Utah, and much of Idaho. By 1850 the shrinkage had been steady, and at approximately the same rate, entirely around the range. At that date the range presented an irregularly oval figure extending from a little south of Great Slave Lake into Texas. It embraced in British America the Saskatchewan region and northward, as said; in the United States, the whole of the Missouri region above Omaha, and the great plains at large, with an eastward boundary through Minnesota, Iowa, Kansas, Indian Territory, and into Texas, and a western one among the mountains of Montana, Wyoming, and Colorado, and on the plains between New Mexico and Indian Territory. In the ensuing twenty-five years the restriction was enormous, at least one-half, if not more, of the whole area occupied in 1850 being abandoned, but with a slight gain of territory in Texas and adjoining parts of New Mexico. By 1875 the herds had been cut into two bands by the railroad, with only a few stragglers left isolated in the mountains of Colorado. The southern or "Texan" herd was practically limited to the northward by the railroad, occupying only a small portion of Nebraska, more of Kansas and Colorado, Eastern New Mexico, and larger areas in Indian Territory and Texas. The northern or "Yellowstone" herd occupies the uppermost Missouri, the Yellowstone, and Milk River region, thus nearly all of Montana and southward to Wyoming. Its extent in British America was greater than in the United States, and much less changed since 1850, being, as before, the region of the Saskatchewan at large, and north about to Peace River, one of the tributaries of Lake Athabasca. At the date of Allen's memoir the limitation of the southern herd was practically Western Kansas, part of the Indian Territory, and North-western Texas—an area altogether only about equal to that of the State of Kansas; of the northern, from the principal southern sources of the Yellowstone northward—in all, an area not much more extensive than Montana. In 1876, I found the isolated Colorado herd living in the mountains dividing North from Middle Park. It was variously estimated at from a few dozen to several hundred. (E. C.)

BISSEN, HERMAN WILHELM (1798–1868), a Danish sculptor, was born Oct. 13, 1798, in Slesvig. His talent for art secured him friends, who sent him to Copenhagen to be educated. At the age of eighteen he began there as a painter, but soon found more satisfaction in sculpture. In 1823 he won the great gold medal, and then went to Rome, where Thorwaldsen at that time was the leader in the world of art. Thorwaldsen taught him not to be too easily satisfied with his work. In 1828 he produced The Flower-Maiden, a work full of promise. On his return to Copenhagen in 1835 he produced his Valkyrie, and was engaged to make a frieze 130 feet long for the great hall in Charlottenborg, The Progress of Ceres and Bacchus through the World diffusing Culture, a work which it took him five years to finish, while he at the same time produced several busts and statues. In 1840 he received an order for eighteen female statues from Greek and Norse mythology for Christiansborg Palace. During a sojourn in Rome in 1842 he modelled The Fisher-Boy, and after his return in 1843, Apollo and Minerva, for the university. Thorwaldsen, who had already employed him to execute his statue of Guttenberg, appointed him in his will to take charge of his museum and to finish any work that he might leave incomplete at his death. Thus it fell to him to execute four bronze statues placed in front of Christiansborg Palace, and the Goddess of Victory over Thorwaldsen's museum. From 1848 until his death he was employed in modelling the great national monuments of Denmark, a work for which he was peculiarly fitted. Copenhagen is full of statues of eminent Danes and of other monuments from Bissen's studio. In the latter part of his life he also produced about 150 portrait-busts, partly to order and partly for his own pleasure. Though not so great as Thorwaldsen, it can truly be said that he did more for Denmark and for the North than Thorwaldsen, as the latter devoted himself almost exclusively to the South. Bissen died March 10, 1868. His eldest son, WILHELM BISSEN, is also an excellent sculptor, and has already achieved success both in portrait-busts and in mythological work. (R. B. A.)

BJÖRNSON, BJÖRNSTJERNE, the son of a Lutheran clergyman, was born in the parish of Qvikne, in Northern Norway, Dec. 8, 1832. He was a wild and unruly boy, and his parents at one time thought seriously of sending him to sea. At the gymnasium at Molde, where he was sent to procure a classical education, his progress was unsatisfactory, and he was the despair of his tutors, who, in spite of all their efforts, could not arouse in him any interest in Latin or Greek grammar. Nevertheless, he succeeded in being admitted to the University of Christiania after having passed with much difficulty the entrance examination. Instead of availing himself of the privileges to which this entitled him, he developed a sudden passion for the theatre, and wrote an historic drama, *Valborg*, which was accepted for representation by the managers of the Royal Theatre in Christiania. The author, however, having become convinced of its immaturity, withdrew it before it was put upon the boards. There existed, at this time, properly speaking, no national drama in Norway. The stage offered a miscellaneous *repertoire* made up of translations, of French comedies and vaudevilles, an occasional adaptation of a German play, and reproductions of the latest novelty from Copenhagen. This miserable state of things Björnson's patriotism could not endure. He began a critical crusade against Danish actors, Danish plays, and the Danish predominance generally in the Norwegian capital. And yet it is difficult to see what would have become of the Norwegian stage at this period if the Danes had not come to the rescue. Björnson himself —although in his patriotic wrath he would hardly have acknowledged this indebtedness—was soon to discover the superior merits of the Danish theatre and the superior refinement of Danish society. During the winter (1856–57) he remained in Copenhagen, laboring unweariedly with new literary problems and rejoicing in the warm recognition which every one readily granted him, even in advance of his achievements. There was a vague expectation at this time that a great Scandinavian poet would appear, and society in Copenhagen was more than willing to hail Björnson as the great expected bard. It was here that he began his literary career, and his activity has since been uninterrupted. He published his first tale, *Synnöve Solbakken*, which, in spite of its brevity and simplicity, became instantly popular and made an epoch in Norwegian literature. It had been the fashion formerly to go to Italy and other romantic lands in search of literary material. Björnson had had the courage to seek it at home. He created, or rather discovered, a series of new national types, and introduced them for the first time into literature. Norse peasant-life had never before been so truly and poetically described, and the characteristics of the Norse peasantry had never been so sympathetically studied and portrayed. The second novel, *Arne*, which was published in 1858, gave further evidence of Björnson's psychological insight, while the freshness and constant surprises of his style revealed an unaffected originality of thought and utterance which only belongs to a great author. On his return from Copenhagen, Björnson was appointed to the editorship of *Norsk Folkeblad* ("The Norse People's Journal"), but was during the following year induced to assume the directorship of the National Theatre in Bergen, recently founded by Ole Bull. He now published in rapid succession a series of national dramas, the subjects of which were taken from the old Norse or Icelandic sagas. As in his novels he had endeavored to define the type of the modern Norse peasant, so in his dramas he strove to discover and to typify the nation's physiognomy in its historic past. From this purpose, and partly also, perhaps, from the exigences of his position in connection with an avowedly national theatre, grew those monumental saga-tragedies, *Limping Hulda* (1858), *King Sverre* (1861), and *Sigurd Slembe* (1862), and the shorter tragedies, partaking more of the character of dramatized historic episodes, *Between the Battles* (1858) and *Sigurd the Crusader* (1872). Besides these he published in the spring of 1860 a collection of his short tales from peasant-life, *Smaastykker*, among which were *The Father*, *The Eagle's Nest*, *A Happy Boy*, and *A Dangerous Wooing* (the latter written in peasant dialect). In *Mary Stuart in Scotland* (1864), a play which had an unexampled success upon the Norwegian stage, Björnson made his first and last excursion into foreign history, and showed also there the genuineness of his dramatic talent. But before all these works had yet been published their author had resigned his position at the Bergen theatre, and had sought refuge from journalistic polemics and peace for creative activity in Rome. It was there, during the years 1860–62, that his plans matured and the dim conceptions of the past years were wrought into clearness. The dramas *King Sverre* and *Sigurd Slembe* were both written in Rome. On his return to Norway in the autumn of 1863, after a prolonged sojourn in Germany and France, the Storthing (parliament) voted him an annual "poet's salary" in order to enable him to devote himself henceforth entirely to literary pursuits. This salary (about $600) was, however, too small to accomplish that for which it was given, and in 1865 Björnson accepted the directorship of the so-called Danish Theatre in Christiania—a position which he held for two years, while at the same time he edited *Norsk Folkeblad*. In 1865 he made his *début* as a dramatist in a new field, publishing a little domestic drama from the life of the upper classes, which gained an immediate popularity throughout the Scandinavian kingdoms, and has also maintained its place in the *répertoire* of the best German theatres. This play, *De Nygifte* ("The Honeymoon"), contains some vague and as yet gentle warnings to the stubborn conservatism of the Norwegian bureaucracy, and may be termed the forerunner of the series of social and political dramas with a distinct lesson and tendency which during recent years have cost Björnson so much of his popularity among "persons of quality," while they have revealed him as a fearless and keen-sighted patriot and a warm-hearted lover of his kind. Before entering upon his career as a reformer, however, he lingered upon the threshold, publishing in the mean while the novels *The Fishermaiden* (1868), *The Bridal March* (1869), the epic poem *Arnljot Gelline* (1870), and an *édition de luxe* of his *Songs and Lyrics* ("Digte og Sange," 1879).

In the works which Björnson has published since 1870 there is a distinct change of tone. He is no longer satisfied with poetic beauty *per se;* he has always an ulterior purpose, and always a good and noble one. To this moral or social purpose, which is unswervingly kept in view, he subordinates all merely artistic considerations; it is his ambition no longer to please and amuse; he sounds a note of warning rather in the ears of the morally obtuse and drowsy and indolent, who, blinded by prejudice and pride, refuse to see the revolutionary forces at work in modern society. In the novel *Magnhild* (1872), which from an artistic point of view is the least successful of all Björnson's novels, it is the old problem of an ill-assorted marriage which engages his attention; there is, however, a sense of constraint perceptible in all the situations, as if the author were conscious of having cast his material in a wrong form, or were uncertain as to the real solution of the problem. The same question, in a somewhat modified form, is treated again in the drama *Leonarda* (1878), where the falseness and inconsistencies of woman's position in Norway are forcibly illustrated. With the exception of the tale *Captain Mansana* (1878), Björnson has written no novels during the last ten years, holding to the conviction that the drama is much better fitted for the treatment of the great problems of the age. Agreeably to this opinion, he has set to work with much earnestness to expose in dramas the abuses under which Norwegian society—or, in fact, all European society—is at present suffering. It is the remnant of feudalism with its inequality and oppression, as opposed to modern industrialism, which he is fond of representing in its varied phases. Nevertheless, Björnson, with his innate artistic instincts, shuns all sensationalism and glaring effects. His later dramas are rather remarkable for their sparing use of mere stage-effect, while they exhibit a careful characterization and great simplicity of plot. They are hardly dramas at all in the sense that the plays of Victorien Sardou and Émile Augier are, but dramatic expositions of the burning questions of the time. Under this category are the following works: *Redaktören* ("The Editor," 1873), *En Fallit* ("Bankruptcy," 1874), *Kongen* ("The King," 1875), *Leonarda* (1878), and *Det Nye System* ("The New System," 1879). A pamphlet, *Extracts from my Speeches concerning the Republic* (1880), and a second and enlarged edition of *Songs and Lyrics* (1880), complete the list of Björnson's writings.

Of late years Björnson has taken a strong interest in the political movements which have agitated his country, and has wielded a great influence in favor of liberalism and parliamentary government. By conviction he is a republican, although he does not favor any sudden change of government and is opposed to all revolutionary methods. He is a most eloquent and impressive orator. The months from September, 1880, to April, 1881, he spent in the United States, studying the practical workings of republican government and lecturing with great success to his countrymen in the Western States. (H. H. B.)

BLACK, Jeremiah Sullivan (1810–1883), an American lawyer and statesman, was born in The Glades, Somerset co., Pa., June 10, 1810. He was of Scotch-Irish descent, and his father was a man of prominence in Southern Pennsylvania. After receiving an academic training and devoting himself for a year to the private study of the ancient classics, Jeremiah studied law, and was admitted to the bar in 1831. He was at once made prosecuting attorney of Somerset county, and soon became eminent in his profession. In 1842 he was appointed president judge of the Somerset district, then comprising three counties, and afterwards five. After the State constitution was amended so as to render the judges of the supreme court elective by the people, he was chosen in 1851 to that position, and having drawn the lot for the short term he became thereby chief-justice. In 1854, Judge Black was re-elected for a term of fifteen years, but in 1857 he was called by his personal friend, Pres. Buchanan, to a seat in his cabinet as Attorney-General. When, in 1860, the Secession movement became formidable in the Southern States, Attorney-General Black, in answer to the President's request for his opinion, maintained the necessary perpetuity of the Union and the duty of the national Government to defend itself against insurrection. But the President refused to reinforce the garrison in Charleston harbor, and Gen. Cass, the Secretary of State, who had urged this measure, resigned; but the pressure of public opinion was such that the President was compelled to appoint to the vacancy Black, who held the same views as his predecessor. With the aid of Edwin M. Stanton, whom he had secured as his successor in the attorney-generalship, and afterwards of Judge Holt and Gen. J. A. Dix, Black preserved during the few remaining weeks of Buchanan's term some show of authority on the part of the administration. Before retiring from the Presidency, Buchanan nominated Black as a judge of the Supreme Court, but the nomination was not confirmed by the Senate. In March, 1861, Black returned to the private practice of his profession, and soon after was appointed reporter of the Supreme Court. He resigned this position on account of the increasing demands for his services in important cases. He was especially prominent in the cases arising from the conflict of the civil and military authorities and from the reconstruction acts of Congress. He was one of the counsel of Pres. Johnson when he was impeached. For his services in cases in which the public interests were involved he uniformly refused to accept a fee. In 1873 he was a prominent member of the convention which revised the constitution of the State of Pennsylvania. Though chiefly engaged in practice at Washington and in the large cities, he resided near York, Pa., and here he died after a brief illness, Aug. 19, 1883. He was universally respected, not only on account of his ability and learning as a jurist, but also of his purity and integrity. He was tall and rugged, with great physical power. Late in life he lost the use of his right arm by a railroad accident, but he soon acquired the ability of writing with his left hand. As a speaker and writer he was eloquent and forcible, and was noted for his vigorous treatment of public and political questions. He published no books, but his articles in newspapers and reviews attracted general attention. In 1838 he was immersed by Rev. Alexander Campbell, the founder of the "Disciples of Christ," and to the end of his life remained a firm believer in the faith of that body.

BLACK, William, a British novelist, was born at Glasgow in November, 1841. He was a student from an early age, his favorite subject being botany, and received his education at several private schools. His early studies of nature and art show their results in the accurate and picturesque descriptions of natural phenomena in his books. His first essays in literature were some newspaper sketches and criticisms. In 1864 he went to London, and there wrote many magazine articles. In 1866 he represented the *Morning Star* as correspondent during the Prusso-Austrian War. At a later date he became editor of the *London Review*, and subsequently assistant editor of the *Daily News*, which position he relinquished in 1875 with the purpose of devoting his time solely to fiction. He has travelled much, one of his journeys being to America, and his close observation is indicated in the realism of his novels. His first novel, *Love or Marriage*, a story dealing with the social problems of the day, appeared in 1868, and other works from his pen appeared in rapid succession. Among these are *In Silk Attire* (1869), descriptive of peasant-life in the Black Forest; *Kilmeny; The Monarch of Mincing Lane* (1870); *A Daughter of Heth* (1871), his first really successful novel; *Strange Adventures of a Phaëton* (1872); *A Princess of Thule* (1873); *The Maid of Killeena* (1874); *Three Feathers* (1875); *Madcap Violet* (1876); *Macleod of Dare* (1878); *White Wings, a Yachting Romance* (1880); *Sunrise* (1880), which describes some secret Socialistic societies; and *Shandon Bells* (1883), an Irish story. He is also the author of a brief biography of Goldsmith (1879). The most of his novels have been republished in the United States, and some of them translated into the languages of the European continent. Besides graphic and poetical descriptions of scenery, his works show truth of feeling and sentiment, with much pleasant play of incident.

BLACKBERRY, a shrub and its fruit, of the genus *Rubus* and order *Rosaceæ*. *Rubus* itself is divided into two distinct classes, the Raspberries and Blackberries, the former known by the fruit slipping off easily from the receptable, leaving the receptacle like a small cone in the centre of the calyx, while in the Blackberry section the receptacle is firmly attached to the berry and separates with it from the calyx. The number of species in the genus is uncertain, but may be about 100, although some botanists place the number much higher. Botanists generally make great allowance for variations in species, and enumerate only about 20 species of *Rubus* for the whole North American continent. The others are scattered over most of the temperate regions of the earth, both in the northern and southern hemispheres.

So recently as 1845, A. J. Downing, the author of a famous work on American fruits, wrote that the Blackberry was seldom cultivated in America, "as the wild fruit is produced in so great an abundance." Soon after Mr. Downing's work appeared the Massachusetts Horticultural Society instituted premiums for the improvement of the fruit, the first good result of which was the introduction of the "Dorchester" by Captain Lovett of Beverly, Mass., who exhibited fruit an inch and a half in length. Immediately succeeding this came the "New Rochelle," introduced by Lewis A. Seacor as "Seacor's Mammoth," but made famous by Wm. Lawton, whose name it generally bears. In 1851 the "Snyder" was found near La Porte, Ind., but was not made known till after the before-mentioned were introduced. Subsequently, the "Kittatinny" was found by Mr. Woolverton on the mountains of that name in Sussex co., N. J. Some twenty or more kinds have been introduced and named, but only the above have proved popular of the "high-bush" class. Of the "low-bush," or Dewberries, only one has achieved eminence, the "Wilson's Early," introduced by John Wilson of Burlington, N. J. All these are wildlings; so far as known, no improvements have been made by experiments in seed-raising. The great superiority of the Lawton and the Dorchester over the ordinary wild kinds was so apparent that by 1855 the Blackberry had become a staple article in fruit-gardens, and fruit-culturists took steps to introduce it on the most extensive scale. It was not long before thousands of acres were planted, and wild fruit driven completely from market. (T. M.)

BLACKFEET INDIANS, the most westerly tribe of the Algonkin family of American Indians. Their dialect has marked differences from those of other tribes of this family—a fact which renders their affinities somewhat doubtful. In place of the Great Spirit of the other Algonkin tribes, the Blackfeet Indians worship the sun. They do not bury their dead, but the body of a deceased warrior is left in his cabin fully arrayed for war, and horses are killed at the door for his use in the other world.

The ancient seat of the tribe was on the Saskatchewan in British America. They were formerly included in the tribe of the Kena or Blood Indians, from which they branched off and migrated to the region of the Missouri, where the name of Blackfeet was given them by the Crows. There a second division took place under the leadership of a chief called Piegan. They are now divided into the Blackfeet, the Blood, the Piegan, and the Small Robe bands, their tribal range extending from Hudson's Bay to the Yellowstone River. In the early days of the settlement of the West they were a fierce and powerful tribe, very hostile to the whites and addicted to robbery. Their possession of horses enabled them to extend their forays to a great distance, and they carried on wars throughout the region from the Missouri to the Oregon. For a number of years previous to 1865 their relations with the whites had been friendly. But the wild stories of the mineral wealth of Montana which then became current caused a rush of thousands of miners to the Territory. The usual results followed. No regard was paid to any rights or protests of the Indians; they were treated as aliens and outlaws, and dealt with accordingly. Their natural efforts to resist the lawless invasion resulted in the death of several whites. At once the acting governor of the Territory proclaimed war on his own account, armed a force of 1000 miners, licensed them to kill Indians, and offered a liberal bounty for every Indian's scalp taken. The Indians tried to evade the scouts and to avoid conflict with the troops, yet a number of them were killed. A lawless white element pushed into the Territory and inaugurated a brisk traffic in whiskey with the Indians. In 1869 some depredations upon the whites occurred and a few lives were lost. These were attributed to a small band of Piegan Indians, and Col. Baker was ordered to make a winter attack upon the offending band, his instructions being very vague and elastic. In January, 1870, he surprised an Indian camp on Marias River, and a slaughter ensued that was nothing less than a massacre. Some 170 Indians were killed, of whom, it is said, only 37 were men, the remainder being women and children. The attack was almost unresisted, only one soldier being killed. The camp proved to be composed of Indians who had been suffering severely for two months with small-pox, and the prisoners taken had to be released for fear of infection. This peculiarly vigorous method of handling settled the troubles with the Blackfeet. Their territory has been opened to settlement, not by treaty, but by force, and there has been no further resistance to the rights of the strongest.

The Blackfeet Indians are estimated at 6000 in Canada and about 7000 in Montana. They are decreasing in number, however, largely through intemperance. A small vocabulary of the Blackfeet dialect was published by George Catlin in his *North American Indians*. The Blackfeet Indians should not be confounded with the Blackfeet Sioux (so called), who are a comparatively unimportant band of Indians of the Dakota stock.

BLACKIE, JOHN STUART, a Scotch classical scholar and author, was born at Glasgow, July, 1809. He was educated at Aberdeen and Edinburgh, and afterwards spent two years at Göttingen, Berlin, and Rome. Having become well versed in modern as well as the classical languages, he published in 1834 a metrical translation of Goethe's *Faust*, with notes and prolegomena. Though called to the bar in that year, he devoted much time to literature, contributing articles on German subjects to *Blackwood's* and *Tait's Magazines* and the *Foreign Quarterly Review*. In 1841 a new professorship of Latin literature was founded in Marischal College, Aberdeen, and Blackie was elected to the chair. His philological articles in the *Classical Museum* in 1850 and his *Metrical Translation of Æschylus* led to his transfer to the professorship of Greek in the University of Edinburgh in 1852. His talents and public spirit have been conspicuous in various departments. He took part in the movement for university reform in Scotland, which led to the appointment of a parliamentary commission in 1858, and finally to some important changes in higher education in that country. In 1853, Prof. Blackie travelled in Greece, and on his return warmly advocated the study of modern Greek. He published an essay on the *Pronunciation of Greek, Accent and Quantity*. He also published a *Discourse on Beauty*, with an exposition of Plato's theory (1858), and two volumes of poems, the first, chiefly on Greek mythology, in 1857, the second, which included some Latin poems, in 1860. His *Homer and the Iliad* (1866) contains a translation of the *Iliad* in ballad metre. In the same year he published a volume of *Critical Dissertations*, and another of *Notes Philological and Archæological*. His *Musa Burschicosa* (1869) is a collection of ballads on various subjects, dedicated to his college pupils. In his *War-Songs of the Germans* (1870) he showed deep sympathy with Germany in the war with France. His *Lays of the Highlands and Islands* (1872) are a testimonial of his devotion to his native land. He has long been an advocate of Scotch nationality, and has endeavored to arouse his countrymen to preserve and cultivate the Gaelic language. By persistent, self-sacrificing labors, he secured the endowment of a professorship of that language in the University of Edinburgh.

Prof. Blackie's fondness for philosophy and his mode of discussing philosophical subjects are well shown in his *Four Phases of Morals* (1871), in which he treats of Socrates, Aristotle, Christianity, and Utilitarianism. The substance of his treatise, *The Natural History of Atheism* (1877), may be stated thus: Theism is the normal belief of the human soul; atheism is a moral and intellectual disorder springing from causes that destroy the soul's natural reverence and foster self-sufficiency. His deeply religious spirit is manifested in another form in his *Songs of Religion and Life* (1876).

Many of his earlier publications, scholastic and poetical, have been revised and republished since 1870. In 1874 his principal philological papers were collected under the title *Horæ Hellenicæ*. His little practical treatise for young men on *Self-Culture* has had extensive circulation in America as well as Great Britain. Prof. Blackie's *Lay Sermons* (1881) discuss with a truly devout spirit, yet with characteristic freedom, some of the moral problems of the time. In his *Altavona* (1882), a series of sprightly dialogues, he brings together in the Highlands representatives of various classes of British society, who discuss the scenery and the social questions suggested by the locality. It abounds in brilliant, humorous, and philosophic passages, and, while deprecating some faults in Highland character, it overflows with genuine, perfervid Celtic feeling. In Aug., 1882, on account of infirm health, Prof. Blackie resigned his position in the University of Edinburgh. Throughout his career he has been a recognized champion of religious and intellectual freedom and the advocate of genuine reform of Scotch institutions. (J. P. L.)

BLACKMORE, RICHARD DODDRIDGE, an English author, was born at Longworth, Berkshire, in 1825. He was educated at Tiverton School and Exeter College, Oxford, whence he graduated in 1847. He was called to the bar in 1852, and practised as a conveyancer. His health having failed, he adopted the business of a market-gardener, which he still practises in the neighborhood of London. He is known widely as a novelist, several of his works having attained great popularity. He belongs to the realistic school; his style is marked by quaint humor and by effectively simple and natural touches of sentiment and description. He has issued the following novels: *Clara Vaughn* (1864); *Cradock Nowell* (1866); *Lorna Doone* (1869); *The Maid of Sker* (1872); *Alice Lorraine* (1875); *Cripps the Carrier* (1876); *Erema, or my Father's Sin* (1877); *Mary Annerly, a Yorkshire Tale* (1880); and *Christowell* (1882). In addition to his novels he has published *The Fate of Franklin, a poem* (1860), a translation of Virgil's *Georgics* (1871), and some other works.

BLAINE, James Gillespie, an American statesman, was born at West Brownsville, Washington co., Pa., Jan. 31, 1830. His great-grandfather, Ephraim Blaine, was a colonel of the Pennsylvania line and a commissary-general in the Revolutionary War. Young James was educated chiefly in Washington county, though he lived for a time at Lancaster, Ohio, in the family of Hon. Thomas Ewing, Secretary of the U. S. Treasury. After a full course of study at Washington College, Pa., where he was specially distinguished for mathematical ability, he graduated in 1847. He then became a professor in the Western Military Institute, Georgetown, Ky., where he spent two years. Meantime, having studied law, he was admitted to the bar in Pennsylvania, but never practised. He was, however, a frequent contributor to newspapers, and in 1853 removed to Augusta, Me., to take charge of the *Kennebec Journal*. On the formation of the Republican party in the following year he became noted as a political speaker, and in 1858 he was made chairman of the State committee of that party, and acquired a control which he has ever since maintained. In the same year he was elected to the State legislature, and continued a member till 1862, being Speaker of the House for two years. He had now removed to Portland, where he edited the *Portland Advertiser*. In 1862 he entered the national Congress, well prepared by previous training and acquaintance with the political history of the country for taking part in the management of its affairs. Steadily he worked his way forward to positions on important committees, while on the floor of the House he was a ready and fearless debater. Impulsive and brilliant, with wonderful memory of persons, facts, and faces, on the death of Thaddeus Stevens he was the leader of the Republican party in the House. In all the important questions of reconstruction after the Civil War he has taken a prominent part. In 1869 he was chosen Speaker, and in this capacity especially distinguished himself by his thorough knowledge of parliamentary rules, his quickness, firmness, and impressive manner. He continued to hold this position till March, 1875, but in the succeeding Congress the Democrats gained control of the House. In the next year, when Pres. Grant's second term was drawing to a close, Mr. Blaine was the most prominent candidate for the Republican presidential nomination, and in the convention of that party held at Cincinnati received on every ballot except the last the highest number of votes. On the seventh ballot the friends of other candidates concentrated their strength, giving a majority of the votes to Rutherford B. Hayes, then governor of Ohio. Mr. Blaine, who had remained in Washington, but was constantly informed of the proceedings, was one of the first to send his congratulations to the successful candidate. In July, 1876, Hon. L. M. Morrill, U. S. Senator from Maine, was appointed Secretary of the Treasury, and the governor of the State selected Mr. Blaine to fill the vacancy in the Senate. Mr. Blaine's energy and vehemence were better suited to the lower House, but he still distinguished himself as an indefatigable worker and as a debater of party questions. In the Republican presidential convention at Chicago in 1880 he was again prominent as a candidate, but Gen. Grant was still more so, and Mr. John Sherman, Secretary of the Treasury, had also many partisans. The friends of Gen. Grant were now called "Stalwarts," a term recently introduced into American political vocabulary by Mr. Blaine to designate his own section of the party, but quickly appropriated by those who still maintained the strenuous opposition to the South and its leaders which had characterized the Republican party during the war and at its close. As in the Cincinnati convention four years previous, the opponents of the leading candidate, finding it impossible to elect their respective favorites, concentrated their votes on Gen. J. A. Garfield, who was a delegate to the convention, and in spite of his protests secured for him the nomination. This choice was confirmed by the people, and as soon as he entered on the duties of the office Pres. Garfield called Mr. Blaine to the chief place in his Cabinet as Secretary of State. But the policy then inaugurated was fiercely assailed by politicians and newspapers, and was violently overthrown by an assassin only four months after the President's accession. While Garfield lingered on his deathbed Mr. Blaine was the representative of the Government. As soon as possible after Pres. Arthur assumed the duties of his new position Mr. Blaine retired from the Cabinet. Upon the assembling of Congress in December he was invited by both Houses to deliver a eulogy on the late President. His address on this occasion, pronounced in the presence of the diplomatic representatives of foreign states as well as of every department of the national Government, was eminently appropriate, dignified, and eloquent. Having retired to private life, he published (1883) a volume of reminiscences entitled *From Lincoln to Garfield*.

BLAIR, a family noted in the history of American politics.

I. **Francis Preston Blair** (1791–1876), a journalist and politician, was born at Abingdon, Va., April 12, 1791. His father, James Blair, removed to Kentucky in 1800, and became attorney-general of the State. Francis was educated at Transylvania University, studied law, and became clerk of a county court. At an early age he took an active part in politics, and in 1824 supported Henry Clay for the Presidency. When nullification views were rife in South Carolina he published an able article against them in the *Frankfort Argus*, which led Pres. Jackson to invite him to Washington to become editor of a Democratic paper supporting his administration. The *Globe*, thus started in 1830, continued under Blair's control for fifteen years, and was the organ of Jackson and Van Buren in their administrations. It did much to shape the policy of the Democratic party. Blair wrote rapidly and vigorously, and poured forth terrible invectives on those who dared to differ from his views. But, owing to the rapidly-increasing power of the Southern leaders, Van Buren was defeated in the Democratic convention in 1844, and James K. Polk, who represented the Texas-annexation policy, was nominated. After his election, Pres. Polk, wishing to put the *Globe* in the hands of his personal friends, offered Mr. Blair the mission to Spain. Although this was declined, Messrs. Blair & Rives, the proprietors, disposed of their paper to Messrs. Ritchie & Heiss. Mr. Blair had acquired wealth, and now retired to his estate at Silver Springs, Md., near Washington, where he lived in elegant style and was frequently consulted by political leaders. In 1848 he still adhered to Van Buren, who became the candidate of the Free-Soil party for the Presidency. After the repeal of the Missouri compromise in 1854, Blair assisted in forming the Republican party. He afterward disapproved of the extreme measures used to suppress the rebellion. Towards the close of the war, acting solely on his own responsibility, he went to Richmond, where he obtained from Jefferson Davis, his personal friend, a letter declaring his willingness to enter into an official conference for the restoration of peace. Pres. Lincoln, upon seeing this letter, agreed to receive any agent sent informally for this purpose. The result was the famous Hampton Roads conference, held Feb. 3, 1865, which Pres. Lincoln attended, but it did not produce any direct result on the war. Mr. Blair continued to live in retirement, being frequently visited by persons interested in the political history of the country, whom he entertained with vivid reminiscences of the great men he had known. He died at Silver Springs, Md., Oct. 18, 1876. While at the height of his political power he had a peculiar reputation as an ugly man, being thin, bony, and hard-featured, yet he did not hesitate to comment freely on the personal appearance of his opponents.

II. **Francis Preston Blair, Jr.** (1821–1875), son of the preceding, a brigadier-general and U. S. Senator, was born at Lexington, Ky., Feb. 19, 1821. He graduated at Princeton in 1841, studied law, and commenced practice in St. Louis. In 1845 he started on a journey to the Rocky Mountains for the benefit of his health. When the war with Mexico broke out, being in New Mexico, he enlisted in the regiment of Col. Doniphan as a private, and served till 1847. After his return to St. Louis he joined the Free-Soil party, and was for a time editor of the *Missouri Democrat*. In 1852 he was elected to the State legislature, and in 1856 to Congress, as a Republican. In 1857 he made a speech proposing to colonize the negroes of the United States in Central America. He was again elected in 1860 and 1862, but resigned his seat in 1863. In the mean time, he had entered the army as colonel of volunteers in 1861, and risen to the rank of major-general. He commanded a division in the Vicksburg campaign, and the Seventeenth army corps under Gen. Sherman in his campaign from Chattanooga to Atlanta, and his march thence to Savannah and through the Carolinas. At the close of the war he returned to St. Louis, where he was appointed collector of the customs and commissioner for the Pacific Railroad. He afterward abandoned the Republican party, and in consequence of a letter published just before the meeting of the Democratic convention in 1868 he was made the Democratic candidate for the Vice-Presidency, but was defeated. In 1870 he was elected United States Senator from Missouri to fill a vacancy, and upon the expiration of his term in 1873 retired to private life. He died at St. Louis, July 9, 1875.

III. **Montgomery Blair**, eldest son of F. P. Blair, Sr., was born in Franklin co., Ky., May 10, 1813. After graduating at West Point in 1835, he served a year in Florida, then resigned, and commenced the practice of law in St. Louis. In a few years he was made United States district attorney, and in 1843 was elected judge of the court of common pleas. In 1852 he removed to the neighborhood of Washington, and engaged in practice in that city. In 1855 he was appointed United States solicitor in the court of claims. Hitherto his political action had, like his father's, been entirely with the Democratic party, yet he was opposed to the extension of slavery. In 1857 he appeared as counsel before the Supreme Court in behalf of Dred Scott, whose case is a memorable turning-point in political history. About this time Mr. Blair severed his connection with his party, and was in consequence removed from his position by Pres. Buchanan. In 1860 he presided over the Republican convention of Maryland, and in March following he was appointed by Pres. Lincoln Postmaster-General. As a member of the Cabinet he urged a vigorous prosecution of the war for the maintenance of the Union. He remained in the Cabinet during Lincoln's first term, though he did not approve the radical measures which the exigences of war compelled the President finally to adopt. After retiring he returned to the practice of his profession. He died at Silver Spring, Md., July 27, 1883.

BLAKE, Edward, leader of the Liberal party in the House of Commons of the Dominion of Canada, was born in the township of Adelaide, Middlesex, Ontario, in 1833. His early education was gained largely at home. under the instruction of his father, Chancellor Blake, and of private tutors. He visited Europe when about fifteen in company with his father, and witnessed in Paris some of the exciting scenes of the revolution which drove Louis Philippe from the throne of France. After his return he entered Upper Canada College, where, though at first he showed no special fondness for study, he afterwards, under the stimulus of ambition, applied himself so successfully as to carry off the governor-general's prize. He graduated in due course from Toronto University as silver medallist in classics. From this institution he also received the degree of M. A. in 1858. Having entered upon the study of law, he was called to the bar in 1856, and obtained a large and lucrative practice. He was for some time examiner and lecturer in equity for the Law Society of Upper Canada, was appointed queen's counsellor in 1864, and in 1871 became barrister of the Law Society of Ontario. His rise at the bar was rapid, and in a few years made him the acknowledged leader in the equity courts of Ontario. He was elected chancellor of the University of Toronto in 1876.

Mr. Blake was from the first reluctant to enter political life, but under the pressure of friends he consented in 1867 to be put in nomination for both the Ontario and Dominion Parliaments, there being at that time no legal obstacle to dual representation. He was elected for both houses. Two years later he accepted the leadership of the Liberal opposition in the local legislature, a position which naturally fell to him as being pre-eminent in legal knowledge, mental acumen, and debating power amongst the men of the party. After the elections of 1871 the Government was defeated on a motion of "want of confidence," and Mr. Blake became premier of the province of Ontario, a position he accepted very reluctantly, and only on condition of being permitted to hold the nominal office of president of the council without salary. Though he remained in office for but one or two sessions, he carried a number of important measures which he had advocated while in opposition, amongst them an Act rendering a member of the Dominion Parliament ineligible to sit in the provincial legislature.

In 1872 he resigned his office in the local House, retaining his place in Parliament.

At Ottawa Mr. Blake also took a front rank from the very first by his legal knowledge and power in debate, rendering valuable assistance to Mr. Mackenzie, who continued for some years to lead the party in the general Parliament. In every great debate the rising of Mr. Blake was looked for with special interest. His mode of dealing with a subject was vigorous and exhaustive, and some of his speeches during this period, notably that on the treaty of Washington in 1872, and that on the "Pacific scandal" in 1873, have been regarded as masterpieces of eloquent and conclusive reasoning. When the Conservative Government was defeated in the last-named year, and Mr. Mackenzie was called on to form a Cabinet, Mr. Blake again pleaded for relief from political duties, but was finally induced to enter the Government as privy councillor without salary. In 1874 he resigned this office, but in 1875 was prevailed on to accept the portfolio of minister of justice in Mr. Mackenzie's administration. The elections of 1878 placed the Liberals once more in opposition and their opponents in office. In 1880, Mr. Blake was formally appointed leader of the Liberal opposition in the Commons, a position he still (1882) holds. The expectations based upon his great influence and splendid talents were doomed to disappointment this year, the Conservatives having again been successful at the general elections in securing a strong though diminished majority. The leading issue in this and the preceding campaign was the protective tariff or so-called "national policy." Canada, like many other countries, had been suffering for years under great financial depression, and prosperity having returned under the operation of the high tariff, the people were persuaded to regard the tariff as the cause, and to be suspicious of the free-trade proclivities of Mr. Blake and his friends. (J. E. W.)

BLAKE, WILLIAM PHIPPS, an American geologist and mining engineer, was born in New York City, June 1, 1826. He graduated from the department of philosophy and the arts (since organized as the Sheffield Scientific School) of Yale College in 1852, and in the following year was appointed mineralogist and geologist in the U. S. Pacific Railroad Exploring Expedition in California. In 1859 he became editor of the *Mining Magazine*, and in 1861 went to Japan under an appointment by the Government of Japan as mining engineer. In connection with Mr. Raphael Pumpelly, his associate, he gave the first systematic course of instruction in physical science in that empire. In 1863 he visited China, and returned to California by way of Russian America, making a geological examination of the valley of the Stickeen River in connection with a Russian expedition. In California and Nevada he was actively engaged in explorations and critical examinations of the leading mines of gold and silver. In 1864 he was appointed professor of mineralogy and geology in the College of California, and was also geologist of the State board of agriculture. In 1867 he was sent by the State of California as commissioner to the Paris Exposition, and on his return took up his residence in Washington and New Haven and edited the official reports of the United States commissioners. In 1871 he was appointed as the geologist and mineralogist of the commission to Santo Domingo, and took a party across that island. He was also appointed from Connecticut upon the Centennial Commission, and for a part of the time was the executive commissioner of that organization. He represented the commission as special agent at the Vienna Exhibition in 1873, and was chairman of the standing committee on classification of the International Exhibition at Philadelphia in 1876. He was also director of the mineral department of the Government exhibition. In 1878 he was appointed as an honorary commissioner of the United States to the Paris Exposition, and served there as member of the international jury and as secretary of the additional commissioners. In recognition of his services at this and previous exhibitions, and of his prominence as a mining engineer, he received the cross of the order of the Legion of Honor from the French Government. He has published a large number of reports and professional works. Among these are *Reports of a Geological Reconnaissance in California* (1855), *Annotated Catalogue of California Minerals* (1864), *Silver Ores and Mines* (1861), *The Production of the Precious Metals* (1869), *Mining Machinery* (1871), *Iron and Steel at the Vienna Exhibition* (1876), *Ceramic Art at Vienna* (1875), *Pottery, Porcelain, and Glass at Paris, 1878* (1880), *Connecticut Industries at Paris* (1880).

BLANC, ANTHONY (1792–1860), first archbishop of New Orleans, was born near Lyons, France, Oct. 11, 1792. He embraced the ecclesiastical state, and after a careful preparation in the schools of philosophy and theology he was ordained in 1816. Shortly after his ordination he joined a band of missionaries whom Bishop Dubourg brought over from France for the diocese of New Orleans. He devoted a year or two to the missions of the diocese of Vincennes, Ind., but in February, 1820, he returned to New Orleans. After laboring successfully there, at Natchez, and at Baton Rouge, he was in December, 1831, again called to New Orleans and appointed associate vicar-general. Without consulting him, Bishop de Neckere, who had succeeded Bishop Dubourg in 1830, obtained from Rome the bull appointing Father Blanc coadjutor bishop of New Orleans, with right of succession to that see. On the death of Bishop de Neckere, Bishop Blanc succeeded him, and was consecrated Nov. 22, 1835. The diocese of New Orleans at that time embraced the whole of Louisiana and Mississippi, to which in 1838 Texas was added. The Catholic population of New Orleans was about one-half French Creoles. In 1820 there were only twenty Easter communions in the whole city, but by the exertions of the bishop and his clergy the number was increased to 10,000 in 1838. Bishop Blanc established a diocesan seminary in the parish of Assumption, and afterwards an ecclesiastical seminary at New Orleans. The number of churches in New Orleans was doubled within a few years after his consecration, and during his episcopate the number of churches in the diocese was increased from 26 to 73 and the clergymen from 27 to 92. Schools, orphan asylums, and religious institutions of every kind were multiplied a hundred-fold. On the 19th of July, 1850, New Orleans was raised to the rank of an archdiocese, with Bishop Blanc for its first archbishop. He died June 20, 1860. (E. L. D.)

BLANC, AUGUSTE ALEXANDRE PHILIPPE CHARLES (1813–1882), a French art-critic, was born at Castres (Tarn), Nov. 15, 1813. He was educated to be an engraver, but finding the occupation distasteful he abandoned it for literature. His first art-criticisms were written for the journals with which his younger brother, M. Louis Blanc (afterwards celebrated as a publicist), was connected. In 1841 he edited the *Propagateur de l'Aube*, and in 1842 he published in Paris the *Almanach des Mois*. In 1845 he published the first volume of a *Histoire des Peintres Français au XIX^e Siècle*; but this work was never completed. In 1853 he issued a volume entitled *Les Peintres des Fêtes Galantes*, the subjects of which are Watteau, Lancret, Pater, and Boucher. This was followed by *Les Trésors de l'Art à Manchester* and *De Paris à Venise, Notes au Crayon*, in 1857. In 1859, Blanc assumed an editorial position on the staff of the *Gazette des Beaux-Arts*, and in 1870 he became editor-in-chief of that publication. His contributions to the *Gazette des Beaux-Arts* were very numerous and valuable. He also contributed largely to the *Histoire des Peintres de toutes les Écoles*, an important work commenced by M. Armengaud. After the Revolution of 1848, Blanc was appointed director of the fine arts, and held the position four years. He was reappointed to this office in 1870 after the re-establishment of the Republic, but resigned it after the retirement of M. Thiers from the presidency, partly for political reasons and partly on account of the antagonisms which his attempts to reform the conduct of the annual salons and other vigorous administrative measures met with. During his first administration as director of the fine arts he conceived a project for having the Panthéon decorated by the painter Chenavard; during his second administration the grand scheme which particularly engaged his attention was the creation of a museum of copies. The *coup d'état* put an end to the first, and the other he was compelled to abandon on account of the opposition of the artists. The argument of the artists was that a museum of copies, even should the copies be reasonably adequate representations of their originals, would have but small intrinsic value in comparison with its cost, and that the Government would do much better to expend its money for original works. The plea was a selfish one, of course, but it had reason in it, and it was supported by the public. In June, 1876, Blanc was elected a member of the French Academy, and in March, 1878, he was appointed to the newly-created professorship of æsthetics and art-history in the Collège de France. He died Jan. 17, 1882. In addition to the above-mentioned works he was the author of the following: *Le Trésor de la Curiosité* (1867), *Grammaire des Arts au Dessin* (1867), *L'Art dans la Parure* (1874), and *Voyage dans la Haute-Égypte: Observations sur les Arts Égyptien et Arabe* (1876). (W. J. C., JR.)

BLANC, JEAN JOSEPH LOUIS (1811–1882), a French author and politician, was born at Madrid, Oct. 29, 1811, his father being inspector-general of Spanish finances under Joseph Bonaparte. His family removed after the fall of the Empire to France, where he received his education at the College of Rodez. He left college during the Revolution of 1830, and joined his father in Paris, where he gave lessons in mathematics. He commenced his literary career in 1832 by writing poems as well as political and literary articles. In 1836 he became chief editor of the journal *Le Bon Sens*, but left it in 1838 to found another radical journal, the *Revue du Progrès*, in which he advocated Socialism as well as political reform. In 1839, in consequence of his *Compte Rendu des Idées Napoléoniennes*, which made a lively sensation, he was attacked and dangerously wounded. His first important work was a treatise on the "Organization of Labor" (Paris, 1840), which had first appeared in his journal. He maintained with great ability and brilliancy the theory of communism in labor. His next important production was his *Histoire de Dix Ans* (Paris. 1841), in which he treated in vigorous partisan style the history of France from 1830 to 1840. It had great success and injured the popularity of Louis Philippe. In connection with his former works, his *Histoire de la Révolution française*, the first two volumes of which appeared in 1847, aided in producing the events of 1848. Blanc took an active part in the formation of the provisional government of 1848, secured the adoption of a decree abolishing capital punishment, and was the author of the motion by which the Bonapartes were permitted to return to France. He gained much popularity among the working-classes by his advocacy of ideal schemes for the communistic organization of labor, but when they demanded a practical exemplification he refused to take the responsibility of revolution. He was unable to control the movement he had aroused, and, being held responsible by the Government for the revolt of the workingmen of Paris in May and June, 1848, he fled to Belgium, and thence to England. There he resided in exile for many years engaged in literary labors. He returned to France in Sept., 1870, and resided in Paris during its siege by the Germans, energetically advocating a desperate resistance. After the capitulation he was elected to the National Assembly, and was there prominent as a radical Republican. He protested strongly against the surrender of Alsace and Lorraine to Prussia. He earnestly opposed all efforts of the monarchists, declaring that "the Republic ought not to be put to a vote, because it could not be called in question." In 1876 he was defeated in the senatorial election, but was elected to the Assembly by three different constituencies, and retained his position in the extreme Left. As a chief of that active minority in 1879 he presented and sustained, in favor of the Communists, the project of full and entire amnesty which Victor Hugo presented before the Senate. He died Dec. 6, 1882.

In addition to the works already named, he continued his *Histoire de la Révolution française*, completing the twelfth and last volume in 1862. He also published a collection of his contributions to *Le Temps* newspaper under the title of *Lettres sur l'Angleterre* (4 vols. 1866–67). Another important work is his *Histoire de la Révolution de 1848* (2 vols. 1870), which is expanded from *Révélations historiques* (1859). A new illustrated edition of his *French Revolution* appeared in 1872. It is a work marked by much eloquence and dignity of style. He also issued *Questions d'Aujourd'hui et de Demain* (1873-74), *Dix Ans de l'Histoire d'Angleterre* (1879), and minor works. He conducted for short periods two newspapers—*Le Nouveau Monde* (1849-57) and *L'Homme Libre* (1876).

BLANCHARD, Thomas (1788–1864), an American inventor, was born at Sutton, Mass., June 24, 1788. He was of Huguenot descent, and was the youngest son of Samuel Blanchard, a farmer of small means. In his youth he was awkward, diffident, and of stammering tongue. He received only a common-school education, and at an early age was employed in a small tack-factory established by his brother, where his work was to head the tacks singly in a vice. The monotonous task seems to have aroused his inventive genius, and at the age of eighteen he conceived the idea of a machine for cutting and heading tacks by a single operation. Six years passed, however, before he completed the machine, and while he was acquiring the means to introduce it he made further improvements. By the form which was patented in 1817 the material was put into a hopper and delivered in the form of tacks, with heads and points more perfect than could be made by hand, at the rate of 500 per minute. In all its essential parts the machine was the same as is now generally used for this purpose. Blanchard sold the patent for $5000 to a company which went extensively into the manufacture. When his reputation as an inventor was established the proprietor of an armory two miles off called him to improve the turning-lathe there used, so that it might shape the breech as well as the barrel of the gun. After a little observation of the working of the lathe he suggested a simple cam motion, which was found to accomplish just what was desired. He was then called to the U. S. armory at Springfield, Mass., to adjust his improvement of the lathe for turning gun-barrels. His thoughts were now directed to a device for turning gun-stocks, and after two years' labor he produced the model of a successful machine which was patented Jan. 12, 1820. By another invention the locks and other parts of the gun were mortised in with great accuracy and rapidity. Blanchard was employed in the Springfield armory for some years, in which time he originated other improvements in the manufacture of firearms, and constructed thirteen different machines which were afterwards generally used. He also invented a steamboat of light draught fitted to overcome the great resistance of the rapids of the Connecticut River. This was patented March 25, 1831, and the form was soon found to be well adapted to the navigation of Western streams abounding in shallows. Meantime several patents were granted to persons who claimed to have made improvements in lathes for turning irregular forms, and Blanchard, who had received little compensation for his invention, was obliged to engage in litigation to maintain his rights. He also continued to improve his own invention, and at last succeeded in constructing a lathe which would turn all irregular forms. This was patented March 21, 1843, and in the prosecution of the lawsuit which finally established his patent it was found that his rivals had ransacked Europe in vain to disprove his claim to originality and priority of invention. It was thus described in Judge Kane's charge in that case: "It consists essentially in a model revolving in contact with a friction-tracer while the rough material revolves with the same velocity in like contact with a rapidly-moving cutter-wheel, either the model and material or else the friction-tracer and cutter having a progressive lateral motion, so that by the revolution of the model and material all the parts of their respective surfaces are presented in succession to the touch of the friction-tracer and the action of the cutter-wheel respectively. It combines the accurate imitation of a slowly-revolving model with the rapid action of a cutter-wheel." After this suit was decided in Blanchard's favor he had no further trouble about infringements of his patent. On account of the great utility of his invention and the expensive lawsuits which had been necessary to establish his first patent, Congress had twice granted him a renewal of it. His perfected lathe was exhibited at the Paris Exposition in 1857, and was busily employed in producing exquisite miniature marble busts of the empress Eugénie from a fine marble bust belonging to the empress. While it could thus be used in multiplying works of art, it was probably more extensively used in common trades than any other invention of recent times.

Blanchard finally settled in Boston, and there having learned from shipbuilders the difficulty they experienced in obtaining timber of suitable angles for various parts of the hulls of vessels, he invented a machine by which timber of any size could be bent to any angle desired without impairing its strength. This was patented May 4, 1858, and proved the most profitable of his inventions. Altogether, he took out more than twenty patents, among which were one for shearing cloth, one for regulating the speed of carriages, one for a circular saw-mill, six for constructing and working ships' blocks, one for cutting dead-eyes, and one for riveting planks on vessels. All of his inventions were eminently adapted to the common requirements of life. By careful study and observation he supplied the deficiencies of his early education, and as he acquired greater self-confidence he overcame his youthful awkwardness and stammering. In his later years he acquired an ample fortune, and obtained among men of culture and influence the place due to his talents and attainments. He died at Boston, April 16, 1864.

See Vol. III. p. 700 Am. ed. (p. 807 Edin. ed.).

BLASPHEMY. This offence is essentially the same in the United States as in England. Indeed, what is known as the common law of this country relating to blasphemy is based upon the English common law and early statutes, and the principles thus deduced govern in absence of legislation. The acts of Assembly in the several States have been held not to abrogate the common law, because they do not vary the class or character of the offence, but simply authorize a mode of punishment and proceeding.

In the case of the Commonwealth of Massachusetts *vs.* Kneeland (reported in 20 Pick. 206) Chief-Justice Shaw gave a general description of the offence, which has been much quoted and frequently adopted in subsequent cases. "Blasphemy," he said, "may be described as consisting in speaking evil of the Deity, with an impious purpose to derogate from the divine majesty and to alienate the minds of others from the love and reverence of God. It is purposely using words concerning God calculated and designed to impair and destroy the reverence, respect, and confidence due to him as the intelligent Creator, Governor, and Judge of the world. It embraces the idea of detraction when used toward the Supreme Being, as calumny usually carries the same idea when applied to an individual. It is a wilful and malicious attempt to lessen men's reverence of God by denying his existence, or his attributes as an intelligent Creator, Governor, and Judge of men, and to prevent their having confidence in him as such."

Profane swearing is said by some writers to be a species of blasphemy, and although this may be denied by others upon certain technical grounds, yet it is an offence so nearly allied to blasphemy that it may properly be mentioned in connection with it, especially as some of the statutes in the United States make no distinction between the two. Profanity was indictable at common law on the ground that it was a public nuisance; and it is still held in the United States that a single utterance of a profane word in a private place, or even in a public street, is not indictable.

The prohibitions against blasphemy are not intended to prevent free discussion in a respectful way, or to abridge the liberty of speech or of the press; and it has been adjudged in those States where the question has arisen that neither the common-law rules nor the statutes are unconstitutional. The test is the presence or absence of malice, and, as stated by a learned judge in Pennsylvania, "no author or printer who fairly and conscientiously promulgates opinions with whose truths he is impressed, for the benefit of others, is answerable as a criminal."

The punishment for blasphemy is determined by statute in the several States. Thus, in Pennsylvania, where blasphemy and profanity are classed together, the offender may be fined one hundred dollars and imprisoned for three months, or either. In Massachusetts he may be imprisoned in the State's prison not over two years, or in the county jail one year, or fined three hundred dollars. In Ohio the penalty for profane swearing is one dollar for each offence, and in Indiana not less than one or more than three dollars. In Vermont a fine not exceeding two hundred dollars may be imposed for blasphemy, and of not more than five or less than three dollars for profanity; and in Connecticut profanity may be punished by a fine of one dollar for each offence, and blasphemy by a fine not exceeding one hundred dollars and imprisonment for a year. (C. H. B.)

See Vol. III. p. 701 Am. ed. (p. 808 Edin. ed.).

BLASTING is that operation by which any solid mass is ruptured by means of an explosive compound. This effect is produced simply by firing a charge inserted in a hole made in the mass to be broken or removed. The various substances used for this purpose will be treated of under the head of EXPLOSIVES, and the tools used in drilling or boring will be described under ROCK-DRILLS. We shall here consider the methods of using them and of charging, tamping, priming, and firing, the rate of progress, and the cost of blasting, giving special attention to American practice.

Fuses.—After the introduction of gunpowder for mining purposes in 1613 the iron tools then used frequently caused accidents from sparks. This led to the substitution of copper for iron and the introduction of reed or rush fuses. It was not until 1831 that Bickford invented the safety fuse, consisting of a thin core of powder surrounded by a cord which is covered by pitch or tar. This fuse burns uniformly, and hence may be cut in lengths sufficient to enable the workmen to reach a place of safety. The Daddow fuse, largely used in the coal-regions, is a tube of paper or thin copper filled with powder and containing a match at one end. The dynamite fuse invented by Lieut. Franzl of Austria is a flexible paper tube filled with dynamite. By extending it into a series of holes and igniting one end, they may all be fired simultaneously; but this result is generally obtained by the use of an electrical current generated by a frictional machine and Leyden jar, a voltaic battery induction coil, or a dynamo-electric machine. Static electricity is the most convenient and effective mode of firing. It was generated at the Hoosac Tunnel by a small cylindrical machine placed in a keg, as shown in fig. 1. The apparatus weighed 18 pounds, and its working was entirely satisfactory. A section of the exploder or friction primer is shown in the same figure.

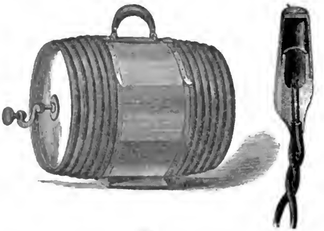


Fig. 1.

Tamping is that operation by which all that portion of the hole not occupied by the explosive is filled with some resisting medium to confine the charge and increase its effect. Before the substitution of copper tools it was attended with great danger. The materials used for the purpose are sand, clay, grass, leaves, straw, quarry-débris, or broken bricks, and for nitro-glycerine water is sometimes used. Many mechanical devices have been patented for this purpose, as cones or plugs with wedges, etc., but the general verdict is in favor of well-dried clay. The tools used in tamping consist of a canister to contain the powder, a set of measures containing given weights of powder, a set of tubes with a funnel, a needle or priming-wire, and a claying-bar, tamping-iron, or rammer, all of copper, and a hammer. When the charge has been poured into the hole, a

Bickford fuse or electric primer is inserted; a wadding of rags, tow, waste, leaves, or other suitable material is then introduced; and in the case of powder this is followed by clay or other substance firmly rammed. In the case of nitro-glycerine Mr. Kalmbach used two wads, with a cover of sand or dust over the first to close the interstices, and an air-space of 6 to 12 inches between that and the second wad. Ordinary tamping is next gently rammed until the last foot of hole is reached, when the tamping may be rammed hard with bar and sledge. Some engineers think it murderous to require men to tamp nitro-glycerine holes.

The direction and depth of holes are best determined by experience, but a few general principles, if observed, will assist in securing favorable results: (1.) If possible, the axis of the hole should never be in the line of the least resistance when powder is used; for nitro-glycerine, especially if tamped, it is immaterial. (2.) The depth of the hole for black powders should be about four-thirds the length of the line of least resistance, and the charge should be about one-third the depth of the hole. (3.) The inclination of the hole must vary with the profile of the rock; it should in general be less than 45° in mines, and may be as great as 90° in open quarry-work. (4.) Clefts, fissures, and cleavage-planes in the rock must be used to advantage. (5.) In regular deep strata the holes should be perpendicular to the bed, in thin strata oblique; and the charge should be placed in the solid rock where possible, so as not to be cut by a seam. (6.) Each shot should be so set as to clear a bearing for the next, and yet blow away a proper volume. (7.) In opening the face of a heading or gallery a wedge-shaped mass should be removed either from top, bottom, or centre, depending upon the dip of the rock. (8.) Short-fissured or very tough rock requires shallow holes; coarse-fissured, moderately tough rock takes holes of average length; and brittle and solid rock, deep holes. In tough rock wide holes, and in brittle rock narrow ones, are the more economical. (9.) The volume of the mass blasted varies as the cube of the line of least resistance. (10.) The difficulty of working in a heading is from four to five times greater than in open cut, and it may be safely assumed that "the expenditure of power and money increases in the inverse ratio of the squares of the areas to be excavated."

Rate of Progress.—The average amount of hard rock, as quartz, granite, porphyry, spar, etc., which a miner can blast in one shift of eight hours is said by Schoen to be 2·5 cubic feet; in softer rocks, as limestone, gypsum, sandstone clay-slate, etc., the progress is about 5·6 cubic feet in eight hours. The rate of progress is so dependent upon innumerable contingencies that no rule can be given, but for hand drilling with black powder in tunnel-headings the average rate per gang in hard rocks may be taken at 1·144 feet per day, and in softer, stratified rocks at nearly double this, or 2·55 lineal feet per day. The average areas of headings being taken at 137 square feet, would give 7·3 cubic yards of material in the first case, and nearly 13 in the second. The average cost per cubic yard for single-track tunnels, as given by Drinker in his admirable work, to which the reader is referred, varies in about the same ratio, being for hard granite rock $5.89, and for shales, slates, etc., $3.12.

The progress with nitro-glycerine is from two to two and a half times that with powder, but it should be used with care near the edges of the tunnel, to avoid rupturing material which lies beyond the neat lines of the work and which would otherwise be self-supporting.

Numerous important improvements have been made in blasting by the substitution of "power-drills" for hand-labor in boring the holes, by which the prosecution of the work is still further facilitated. As before stated, no definite relation can be given between the rates of progress by hand and machinery, as the contingencies are so variable with the material, kind of drill, motor, position of hole, etc. The relative rates of drilling holes, as given by the Iron Mountain Co., Mo., are—"by hand, 6 feet in ten hours; by the Ingersoll rock-drill, 30 feet in iron ore, 40 feet in porphyry, and 65 feet in limestone, in the same time; with a corresponding cost of 83 cents per lineal foot by hand and 23¼ cents by machinery. Holes, 2½ and 3¼ inches in diameter."

At the Knoxville marble-quarries the average progress is 140 feet in ten hours for each drill with two men; by hand it is 22 to 24 feet in ten hours with three men. The cost of drilling by steam is not over one-sixth of that by hand. In limestone rock, where the progress by hand was 9 feet per day, that by power-drill was 45. The rate of drilling varies from 1 to 3 lineal inches per minute; about 2 inches in granite when working without interruptions.

In the Comstock mines of Nevada the usual *depth of holes* is 5 feet. There is a difference in the cost of power and hand-drilling of at least 50 per cent. in favor of power-drilling. In a 4 × 6 drift through moderately hard porphyry the progress is 160 feet per month with one drill; 300 feet have even been made by extraordinary exertion with two drills. Cost of drilling per foot, 25 cents.

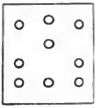


Fig. 2.

The system of drilling is shown in fig. 2. The bottom holes are discharged first, then the top holes.

The use of modern explosives has led to a modification in the position and depth of the drill holes; thus, instead of shallow holes of from 2 to 4 feet, they are made as deep as from 9 to 12 feet and over. In American tunnel-work for headings it is customary to arrange the holes in vertical rows on either side of the centre, those of the inner row being so inclined as almost to touch at the end of the hole; these are blasted first to remove the central vertical wedge; in the next set of holes the inclination is more nearly perpendicular to the face of the work, and this inclination is increased in each series until it may exceed 90° in the last rows near the walls. Thus in fig. 3 the holes C drilled in pairs to a depth of about 10 feet are first blasted, followed in turn by the series 1, 2, 3, etc.

In hard, tough rock it takes about four eight-hour shifts to drill, blast, and square up a cut of 12 feet in depth in an 8-foot heading containing 175 square feet, or 65 cubic yards, for the entire cut. This requires a force of 20 men, which gives 2·7 cubic feet per man per hour with the aid of power-drills, without allowance for contingencies. In estimating the number of men in a gang the helpers, nipper, foreman, and machinists should all be included.

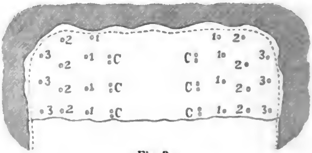


Fig. 3.

Probably two cubic feet per man per hour with steam-drills would form a safe basis for estimating average progress when the higher explosives are used in tunnel- or mine-work.

A good general idea of the form, size, and mode of working of the power-drills now in use may be obtained by referring to fig. 4, showing one mounted for various classes of work. (For further particulars see ARTESIAN WELLS and ROCK-DRILLS.)

Fig. 4.

A novel method of sinking deep shafts was tested by the Philadelphia and Reading Coal and Iron Co., near Pottsville, to open a synclinal in the Mammoth coal-vein. Two shafts, 25 × 13 and 16 × 13, were sunk to a depth of about 1500 feet by means of the diamond-drill bit attached to long sections of gas-pipe 1¾ inches outer diameter. The drills are mounted on frames in the shafts, and bored to a depth of more than 300 feet before removal for blasting. The average rate of boring was 34 feet in twenty-four hours. The deepest hole was 334½ feet, bored between Jan. 17 and Feb. 1, 1872. After completing 25 holes in the smaller shaft, the machines were transferred to the larger, where 35 holes were sunk, while those first bored were filled with sand to within a few feet of the surface. A plug of half a foot of clay was then driven in, a dualine cartridge inserted and tamped, and the nine central holes were then fired simultaneously. Thus, the core being removed, the holes on one side were charged and fired, followed by those on the other. This operation was repeated until the entire depth of the holes was blasted. More time was required to drill the holes than to blast them. The expense was about the same as by the ordinary method, but a saving of about 50 per cent. in time was effected.

The organization for tunnel-work consists of three gangs of about sixteen men each, making three shifts in the twenty-four hours for the heading. In rear of these a second set of men is employed on the bench or bottom, who remove about 7 feet more of the depth; a third set takes out the bottom to the full depth, and another gang blasts for the drain or "trims up." Thus these four gangs of about sixteen men each at each end of a tunnel, with three shifts per day, make a total of 384 miners, besides track-layers, rock-men, engineers, blasters, dumpers, blacksmiths, machinists, helpers, time-keepers, foremen, and clerks, which swell the figures to nearly 900 men and the pay-rolls to between $40,000 and $60,000 per month.

Submarine Blasting.—In submarine operations rock may be removed by exploding charges laid directly upon or against the surface; by drilling holes, from a fixed or floating platform, into which the charge is inserted; by enclosing the surface to be operated upon in a coffer-dam, and after pumping proceeding in the ordinary manner of open cut; or by undermining a sufficient mass to permit the superincumbent crust to fall, after explosion, beyond the draught or danger limit. Most of these methods have been applied recently in the removal of dangerous reefs in the harbors of the United States.

In Erie harbor the Philadelphia and Erie Railroad Company increased the depth of water at their pier from 6 to 14 feet by the removal of a reef consisting of smooth, hard shale. The strata, 8 to 12 inches thick, were drilled through and blasted during the winter of 1867-68. The drilling was done by hand through the ice, and the blasting with powder in cartridges. The largest charge was a canister 2 inches diameter and 40 inches long, fired by dropping red-hot nails down a tube. The holes were drilled at corners of 5 feet square to a depth of 15 feet from the water-surface. During the next season of 1868-69 nitro-glycerine was substituted, with such greatly improved results as to "render dredging as easy as that of gravel, and to a depth of 17 feet, while with powder it was difficult to obtain 14 feet." "Gunpowder does not blast to the depth of the hole, while nitro-glycerine tears the rock from the bottom, and here seems to have penetrated 3 feet beyond."

The latest, most economical, and most expeditious device for submarine work is that invented and patented by William L. Saunders of New York. It consists of a combination of a drill enclosed in a tube, which also contains a pipe and an ejector for removing the débris.

In the accompanying figure (5) *A* represents an ordinary drill-rod; *B* the tube or enclosing case, consisting of two or more telescopic sections of pipe resting in a funnel-shaped section b^2, tapering to a pipe b^3 of smaller diameter. The pipe *C* conveys water to the drill-point, serving to keep it cool as well as to remove the débris, which is ejected through the short discharge-pipe *D* by means of a nozzle *e* which forms the lower extremity of the pipe *E*, down which is passed a jet of water or steam. By means of the enclosing case the drill-rod is enabled rapidly to penetrate any loose material overlying the solid rock without jamming, dredging, or losing the hole. The drill does not require to be so frequently removed, and the débris, being carried away at once, does not impede its progress or weaken the blow; when the drill is withdrawn the hole does not fill up, and a cartridge can be readily inserted without a diver by simply lowering it through the enclosing tube. A tamping of sand may be poured in, the wires connected to a float, and the plant be removed for the next hole.

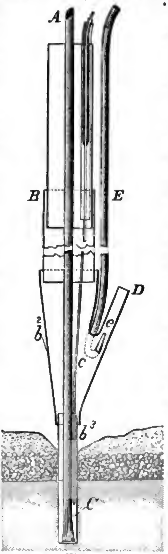


Fig. 5.

The comparative economy of this device may be seen from the following extract from a report of the engineer of the work at Black Tom Reef in New York harbor: "The contract-price for removal was $2 per cubic yard. In this the contractor made more than 100 per cent. profits. In the removal of Way's Reef (by the drilling-scow) Gen. Newton reports to August, 1875, the cost per cubic yard as $18.26. The material was the same—viz. gneiss." By the use of this apparatus the total average daily expense was $65.50, while the average number of cubic yards of rock removed each day was 14·93, making the average cost per cubic yard, $4.38.

References.—R. Raymond, *Mines, Mills, and Furnaces* (N. Y., 1871); *Reports Chief of Engineers U. S. A.*; *Reports Essayons Club U. S. Engrs.*, No. 9; H. S. Drinker, *Tunnelling, Explosive Compounds, and Rock-Drills* (N. Y., 1882); W. P. Blake, *Mining Machinery* (New Haven, 1871); Weale's Series, *Blasting and Quarrying of Stone and Blowing up of Bridges*; Sir Charles Pasley, *Memoranda on Mining*; *Professional Papers U. S. Corps Engrs.*, No. 23. (L. M. H.)

See Vol. III. p. 704 Am. ed. (p. 811 Edin. ed.).

BLEACHING. Before either spun cotton yarns or woven tissues are fit for dyeing or printing they undergo a series of mechanical and chemical processes to free them from all adhering substances which either naturally belong to the fibre or are purposely introduced during the operations of spinning and weaving. Pure cotton is of a dirty yellow color, and if this tint were not removed by bleaching it would materially affect the brighter shades of dyes imparted to tissues or diminish the effect of many beautiful printed patterns. Bleaching also removes from cotton the grease, which if allowed to remain would prove very injurious both in dyeing and printing, either preventing the fixation of color or else acting as a mordant, especially after partial oxidization by the air, and thus attracting the dye in an irregular manner.

Before bleaching the cotton fabric is singed, in order to remove the nap and render the surface perfectly smooth. This is done either by passing the fabric through a gas-flame or over a heated copper plate. In the latter case there was formerly great waste of fuel in maintaining the heat of the plate, owing to its free radiation into the atmosphere; but this has been remedied by an invention of Mr. Thom, who enclosed the plate in a brick arch, so arranged that no air can enter the chamber except that passing in with the stuff, and the limited quantity thus admitted is conducted by flues into the furnace which heats the plate. In England a new gas singeing-machine has been patented by Mr. James Cook, in which the flame is made to flow upon the surface of the fabric. The flame employed is a mixture of coal-gas and oxygen, and the fabric is passed over it with great rapidity to remove the nap without injuring the fibre. The machine is both quick and economical, and does not allow of the escape of any offensive odor during the operation. At the works of Messrs. Edmund Potter & Co. of England more than

4000 pieces of calico were singed in a day, with a consumption of only 4000 cubic feet of gas.

Mr. Kent of Moscow, Russia, and of Nottingham, England, has patented an improvement in cleansing and bleaching, much used by parties working on a small scale. A mixture in the proportion of about 2 pounds of carbonate of soda to 1 pound of lime is made with water, and after settling the clear liquor is drawn off. It is found that the strength of the liquor when used for fine light goods should mark about 1½° of Twaddle's hydrometer, and for heavier goods a greater strength is required. The yarn, thread, or other preparation of vegetable fibres is steeped in this liquor for from thirty to fifty minutes, fine goods requiring a shorter time than coarse ones. The process of cleaning and bleaching is finished in the ordinary manner by washing, and then treating the fibrous materials with dilute sulphuric or hydrochloric acid and chloride of lime; but this will now require not more than from forty to fifty minutes.

In order to render fabrics suitable to be dyed with madder, they must, after being prepared as already explained, be boiled for two or three hours in a weak solution of carbonate of soda and resin. The greasy matters are thus formed into a sort of soap, which is easily removed.

"Souring" removes all excess of lime and breaks up the insoluble lime soap. It still leaves the grease upon the cloth, but in such an altered state as to be easily removable by the subsequent "bowking." Hydrochloric acid is sometimes employed in this souring, but very dilute vitriol may be used. The hydrochloric-acid sours are used cold and at a strength of 3° Twaddle. The bowking, or boiling with soda ash and soap, dissolves and removes all grease and dirt from the cloth. The soap is made from prepared resin, which has the specific effect of improving the whites during the subsequent process of dyeing. The boiling need not take so long a time as the dyeing; the time required, however, depends upon the size of the kier and the number of pieces. The last process, that of passing through a clear solution of bleaching-powder, destroys the slight buff or cream-colored tinge still adhering to the cotton. The goods are allowed to remain some time with the chloride of lime in them, and are finally passed through sours to complete the operation. The acid sets the chlorine free from the bleaching-powder, at the same time removing the lime and acting on any traces of iron that may be in the cloth. This souring should always be made with hydrochloric acid, as it prevents any sulphate of lime from being fixed in the fibres and producing bad whites in dyeing; it also effectually removes any iron and leaves the goods soft.

Tables of strengths and proportions of substances employed in bleaching are not of much value, since they must be modified according to circumstances; but as an example the following particulars may be quoted: For 14,000 yards of nine-eighths printing cloth, 66 reed, 250 pounds of quicklime were used in the liming; 110 pounds of hydrochloric acid for the first souring; 140 pounds of soda ash at 48 per cent. alkali, and 80 pounds of prepared resin, or resin soap made with resin and caustic alkali, were used in the bowking. The last souring was sulphuric-acid sour at 3° C. (37·4° Fahr.); the quantity of bleaching-powder was such that the solution stood at 1° = 1·006 sp. gr. Chloride of lime is generally termed "chemic" in the dye-house, and its solutions are made up to ½° Twaddle, or 1·0025; but in some establishments this is increased to 5°. There is danger of rotting the cloth when very strong chemic is employed, the process generally consisting in passing the articles rapidly through with the calender in order to saturate them, and then running them through the acid bath, the final operation being the washing. The calender renders the passage through the chemic very rapid, so that strong solution, even for fine goods, can be employed. The chemic must be clear, for any lumps of the chloride of lime coming in contact with the cloth would rot or burn it, leaving holes. Commercial chloride of lime is a mixture of calcium and hypochlorite of lime. In the process of oxidizing the foreign matters, which it is the purpose of bleaching to remove, the chloride is inefficacious; but the hypochlorite, under the influence of the water or that of the carbonic acid of the air, sets free oxygen in its turn, rendering the coloring-matter soluble; the oxygen is separated, according to the following equation: $CaO, ClO = CaCl + O_2$. That is, one atom of hypochlorite of lime sets free two atoms of oxygen, while one of free chlorine sets free only one atom of oxygen, according to the equation $Cl + HO = HCl + O$. We thus see that the mixture known by the name "chloride of lime" contains only one-half of its chlorine in effective condition.

After the cloth has been passed through the liquors employed in the process of bleaching, it becomes necessary to discharge the fluid; and this operation is effected by rollers or squeezers. These rollers are generally worked by steam-power. There are many varieties of these machines, the description of which belongs, however, to mechanical engineering, and is not essential in a description of bleaching.

When squeezed, the cloth, if required for printing, needs no further operation, but if intended for the market must be "finished;" that is, starched and calendered. Many bleachers prepare their own starch. The starch is colored with blue, generally ultramarine, and is applied to the cloth by means of rollers dipping into the starch, other rollers removing the excess. The starch need not be pure; fine clay or gypsum is sometimes employed with it. The pieces of cloth are sometimes artificially weighted with sulphate of baryta during the finishing, or with silicate of soda, the object being to render the cloth solid in appearance. In the calendering-machine smoothness and gloss are imparted to the cloth by means of heated rollers. The pieces when calendered and finished are subjected to hydraulic pressure.

Bently Process.—By all dyers and bleachers having extensive business the continuous process, sometimes known as the Bently or Pendleton process, is generally adopted. It was first patented by David Bently of Pendleton in 1828, and consists in drawing the goods successively through all the bleaching solutions in the following manner: The pieces, having been singed, are sewn together and arranged in a carefully-constructed rope coil, being generally drawn through an aperture of glass or earthenware to impart this form. They are drawn into and boiled in the first kier, containing 1 pound of caustic lime to 14 pounds of cloth. The kier is constructed to hold about 500 gallons, and the boiling is continued for thirteen hours. The pieces are next washed in the washing-machine, and are then passed through a sour of hydrochloric acid at 2° Twaddle. Supposing 3500 pounds of cloth to be used, they are next bowked in a soda-ash and resin solution containing 170 pounds of soda ash, 30 pounds of resin, and 500 gallons of water. This boiling is continued for sixteen hours, and the goods are again washed. The cloth is next saturated with chemic, or a solution of chloride of lime, for two hours, the density of the solution being about ½° Twaddle, when it is again washed. The whole is now boiled in a kier for five hours with 100 pounds of crystals of carbonate of soda, and after washing it is treated with chemic as before; then soured in hydrochloric acid of 2½° Twaddle. The cloth is next allowed to drain, is washed until quite clean, squeezed between rollers; finally, being dried over steam cylinders or by means of a hydro-extractor.

To effect these operations in one continuous process many improvements have been suggested upon the plan pursued originally by Bently, of which the most important recently are those patented by Mr. Barlow in 1866. This invention combines in one machine not only the various apparatus required for bleaching, but the operations successively of dyeing, printing, and sizing, subdividing the troughs or cisterns containing the mordants and the dyes by cross-partitions, so that the several threads passing through the machine at the same time may be dyed in different colors or partly left uncolored. These machines are, however, not adapted to the bleaching of linen, as it does not possess the elasticity of cotton, and the strain would either make the cloth too narrow or tear it.

The bleaching of raw cotton on a small scale is easily effected by the following method: Boil the cotton in fresh water a few minutes; then pass the cotton into a vat containing chloride of lime. The cotton should be handled for fifteen minutes, then allowed to remain for four or five hours, being placed upon an inclined board to allow the liquor to drain back. The cotton should now be rinsed in small quantities. To every rinsing add 1 pound of diluted sulphuric acid; stir the cotton in this sour for a few minutes, then let it drain off, and give the cotton a few more waters, so as to rinse all the acid away; then dry. The cotton will be quite white and easy to spin. The expense, inclusive of drying, will amount to about 4 cents per pound.

Flax.—It is well known that the use of chloride of calcium in combination with an acid suffices to completely bleach cotton, but this is not the case with flax. It has till lately been necessary for the purpose of perfecting the bleaching process to spread out the latter on a meadow, except in cases in which the yarn is to retain a cream color. Too strong a solution of chloride of soda, besides, injures the flax. The latter becomes hard to the touch and rough, and imparts to it so firmly its brown coloring-matter that it is subsequently almost impossible to bleach it thoroughly. Mr. F. W. Hodges has succeeded in perfecting a process by which flax can be bleached, while at the same time the threads receive a peculiar finish. Instead of chloride of lime he uses hypochlorite of magnesia as the bleaching agent. This substance had already been applied, but the process was too expensive. Mr. Hodges discovered a novel method of preparing it, by far the least expensive one yet known. Taking a solution of the natural sulphate of magnesia, also called kierserite, which is obtained in great quantities at Stassfurth among the waste salts ("Abraumsalz"), he adds a solution of common chloride of calcium. A double decomposition then takes place, hypochlorite of magnesia remaining in solution, while sulphate of lime is precipitated at the bottom of the tub. This sulphate of lime is gathered and calcined; it is so fine that its commercial value is much greater than that of plaster of Paris obtained in the ordinary manner. The clear solution constitutes the discoloring liquid employed by Mr. Hodges.

A new process is employed at the factory of Mr. W. Sibbald Johnston at Hietongs, near Belfast, Ireland. The principle upon which it rests is to set free the chlorine and the oxygen of the hypochlorite, not by an acid, but by the carbonate of soda. Carbonate of magnesia is then precipitated, and the active principles are set free. In practice, there are used ten vats and twelve coops, furnished with a swivel; each coop is filled with water or an active solution, as well as furnished with steam pipes. There may be worked in it at a time as much as 550 pounds of yarn. On top of these coops there are rails supported by posts, with a movable crane for the purpose of transporting the swivels from one coop to another. In connection with this crane there is an hydraulic pump capable of transferring a swivelful from one coop to another in a few seconds. After the skeins are boiled, washed, and wrung in the usual manner, they are placed on a wagon which carries them to the first coop; there they are placed on the swivels and are made to move by the aid of steam, first in one direction and then in another, in a solution of carbonate of soda heated by steam pipes. As soon as the threads are well impregnated with carbonate the swivel is lifted to the next coop, containing the discoloring liquid; there the material is worked till the desired color is obtained. In the same manner the skeins are transferred to a fresh coop filled with water, where they are washed. The operation is then completed, and the threads possess a remarkable finish. The process may also be used for bleaching cotton and other fibres. It is decidedly to be preferred for fine tissues, such as lawn, owing to the absence of caustic lime, and it is even asserted that tissues thus bleached are more susceptible of receiving coloring-matter when dyed. The magnesia salt is moreover cheaper and more rapidly effective for enlivening purposes when used in the place of hypochlorite of lime or hypochlorite of magnesia in printing.

Patent Dry Process.—A wooden vat, lined with lead or enamelled sheet iron, 9 feet long, 6 feet high, and 4½ feet wide, capable of containing about 300 pounds of the goods, is used. This vat communicates by a rubber tubing with an apparatus consisting of two parts made of earthenware or glass. The apparatus contains a mixture of quicklime, chloride of lime, alcohol, acetic acid, and water: the whole is treated with sulphuric acid, which develops about 2 cubic metres (2·61 cubic yards) of gas and steam. These fluids are under a pressure of two atmospheres, and after two hours the bleaching is finished. In order to remove every trace of odor it is sufficient to put in the vessel hydrogen gas, mixed beforehand in a wooden vessel with carbonic acid and sulphuric ether. After fifteen minutes of this treatment the goods are ready for market.

In decomposing chloride of lime for bleaching on the large scale, it is advantageous to use bicarbonate of soda instead of sal soda, as by it there is formed a fine crystalline precipitate of carbonate of lime, from which the supernatant liquid is easily decanted off, whilst when soda crystals are used an emulsion is formed which deposits but slowly. A slight excess of the bicarbonate is not injurious. Bleaching-liquid thus prepared bleaches perfectly and rapidly all kinds of linen and cotton fabrics.

Most bleaching agents produce a more or less rough surface. This is corrected by using peroxide of hydrogen, which can be used in very slightly alkaline or acid baths. It is particularly good for sponge, hair, feathers, silk, ivory, bones, etc. The articles must be well cleaned and washed. The bleach-bath is prepared with the peroxide of hydrogen in proportion to the article to be bleached, and sometimes a slight trace of alkali may be added with advantage. The goods lie in this bath until white, which requires from two to fourteen days, but heat, not to exceed 76° Fahr., may be applied to hasten the result. Articles are not made brittle by this process.

Linen rags for paper making are bleached with about 5 per cent. of chloride of lime to about 1 per cent. of sulphuric acid. The same proportions will answer for jute. Esparto requires more lime in proportion, as also straw. If properly mixed previously they may all be bleached together. Old paper-stock is bleached with caustic soda. Straw for hats, etc., is best bleached in the sulphur-house, as described for silk, after it has been previously well dried, first in a stove, then in the sun.

Bleaching Silk.—Raw silk contains nearly one-fourth gum or resinous matter. To extract this, a vessel that will hold 15 gallons is filled one-third with water, having 5 ounces of soap for each pound of silk. After boiling, the vessel is filled up, and the skeins of silk, with a wooden rod passed through them, are suspended in the soap-bath. After this has stood at about 90° Fahr. for thirty minutes it is boiled for one hour, during which time the silk is thoroughly subjected to the action of the soap. When properly cleaned the silk is of a dull white and soft. It requires to be treated again in the same manner if it is to be dyed with very fine colors; for dark colors it is sometimes boiled in bags. After well washing it is wrung up, and is ready for dark colors; if light colors are required, it must pass through a sulphurous-acid bath or hung to bleach in a sulphur-chamber; for china white it is treated with cream-white annatto; for blue white, with sulphate of indigo, called chemic; for French or reddish-white, with archil, etc. When silks have been boiled they often lose a quarter of their weight; this loss can be replaced by using bichloride of tin or barytes, but the touch of the silk will be spoiled. Glycerine or sugar syrup may also be used, but even this deteriorates the quality of the silk. Sulphuring requires from twenty to forty hours, and is accomplished in an airtight chamber, the skeins of silk being placed on wooden rods at just sufficient distance apart to allow the fumes to find access. As the silk comes from the sulphur-chamber it is immersed in a bath of boiling water containing 6 pounds of cream of tartar to 200 gallons of water. After being boiled for one and a half hours the silk becomes spongy to the touch, and will absorb dye more easily. It is a fact not to be overlooked that the softening process causes the silk to lose more of its viscosity than the perfect cleaning. In highly loaded silks the whites are always applied to boiled silk; grenadines must be boiled on a stretching apparatus, so that they may not shrivel; braids of flakes may be boiled with soap or caustic soda, and must then be washed well. After being fumed with sulphur, as previously described, they are passed through sulphuric acid to give them a crisp touch, or through sugar and gelatin to give them the soft feeling of sewing silk.

When cotton is to be mixed with silk, the very finest and most uniformly spun threads are selected, and after being boiled and bleached they are dressed as follows: The surface of the fibre is covered with a starch containing white wax of paraffin or stearic acid. By means of brushes this is transferred to the threads as they pass over two cylinders constantly turning. This imitation of silk is used for corded silk, fringes, cords, and backs of satin, etc. (F. J. B.)

BLEDSOE, Albert Taylor, LL.D. (1809–1877), an American mathematician and theological writer, was born in Kentucky, Nov. 9, 1809. He graduated at West Point in 1830, and served on the frontier till 1832, when he resigned. He then became professor of mathematics successively in Kenyon College, in Miami University, in the University of Mississippi, and in the University of Virginia. He also practised law in Springfield, Ill., from 1840 to 1848. During the civil war he was assistant secretary of war of the Southern Confederacy. At the close of the war he went to England, but returned in 1867, and opened an academy in Baltimore, Md. He also established the *Southern Review* in the interests of the Methodist Episcopal Church (South), and was the principal writer in it until his death, soon after which the *Review* was discontinued. He died at Alexandria, Va., Dec. 8, 1877. Besides his numerous contributions to literary, scientific, and theological reviews, he published *An Examination of Edwards on the Will*, 1845; *Theodicy, or the Vindication of the Divine Glory*, 1856; *Essay on Liberty and Slavery*, 1856; *The Philosophy of Mathematics*, 1871. His discussion of the human will has been highly esteemed by many metaphysicians, and was republished in his *Review*. He wrote *Is Davis a Traitor?* and a noteworthy pamphlet on the Reformed Episcopal movement.

BLIGHT is defined by Worcester as "a pestilence among plants; an injury or disease incident to plants; mildew; anything nipping or blasting." In the accepted terminology of English cryptogamic botanists the white mildews are called "blights." For practical purposes one may accept the definition given by Worcester, and include under the term blight all smuts, rusts, white rusts, moulds, and blights, using these names as they are understood by botanists. The first of these are the *smuts*, also variously known as "black ball," "chimney-sweeper," "dust-brand," and "bunt." These are names suggested by the peculiar dirty, black, powdery mass which is associated with the external and conspicuous manifestation of the matured fungus. Collectively, the smuts are known as *Ustilagineæ*. All are parasitic on, or in, the tissues of the higher plants, and most of them mature their spores in enlarged ends of the haustorial threads which ordinarily branch from the spore-thread in the stem of the host-plant, enter the seeds, and ripen their spores about the same time that the host-plant ripens its seeds.

It is not invariably the case, however, that this ripening of the spores takes place in the seed of the host-plant. Sometimes, as in the smut of the Indian corn, the ripening may take place in the husks, leaves, or even in the stem. The growth from the spore (an analogue of the seed) presents in the *Ustilagineæ* many points of interest. The more common mode is for this spore to send out a tube which produces round, oblong, or linear bodies that often join (copulation); after which a new thread may spring from the uniting parts. It is, however, to be observed that even in the same species of smut the subsequent growth may occur without this so-called copulation. Hence, that process cannot be regarded as either sexual or essential. In some instances the spore-thread, falling upon a leaf, bores its way through the point of its contact with the epidermis-cells of the host-plant, and so enters the tissue of the leaf, and thence ramifies through the whole plant. This has been clearly traced and well illustrated by Woronin. In the majority of species, however, the mode of entry is quite unknown. When once the spore has succeeded in sending its threads into the foster-plant, these threads send out lateral suckers (*haustoria*) into the cells of the supporting plant, and from them steal the nutriment upon which the smut lives. Of course this is done at the expense and to the detriment of the host-plant. In all the *Ustilagineæ* the spores are exceedingly minute—in fact, dust-like and microscopic in size; and, hence, being correspondingly light, they are quite capable of being carried to remote points by wind or by insects, and so spreading the smut-growth. These smuts have sometimes been charged with the production of diseased conditions in man or in the lower animals when eaten. It is not at present possible to affirm whether or not this opinion is well founded. Woronin has recently ventured the suggestion that among some of the smuts there is at least one other and unlike form of fungus which grows on other plants, and which may be an essential part or stage of the life-history of the smut. In fact, we shall see that something of the kind obtains among the *Uredineæ* (or rusts). The genus *Ustilago* is large, and furnishes most of the smuts which force themselves upon our notice. Thus we have *Uredo carbo* on Wheat, Oats, Barley, and other grasses, and *U. Maydis* on the Maize; Wheat-bunt is *Tilletia caries*. *Urocystis cepulæ* infests Onions.

The *rusts*, collectively, are known as *Uredineæ*, and infest living plants. Wheat-rust is unfortunately so common in America that it is too well known by its ravages upon the growing crop. The name *rust* comes from the color which it imparts to the host-plant. Aside from the extensive damage which it does, rust is also interesting from the fact that it gives a clear illustration of the three different stages which are now well known, and which have been conclusively proved to be peculiar forms of a single species. For the completion of this process at least two distinct host-plants are requisite. The first manifestation of the fungus may be as a mass of minute cups which appear on the leaves or stems, and which contain round spore-like bodies strung together in a chain and arising at the base from a short pedicel. Associated with these (often on the other surface of the leaf) are flask-like cavities containing thread-shaped bodies which are supposed to represent the male element. These are called *spermagonia*, and the threads, *spermatia*; whilst the cup-like portion first alluded to represents the so-called "cluster-cup" condition. The spore-like bodies from the cluster-cup, falling upon the Wheat as a host plant, germinate, producing underneath the epidermis a mass of round, single-celled spores which eventually come to the surface by rupturing the epidermis, and are then recognized popularly as rust, and by botanists are called uredospores. Later, on the same plant, often in the same mass with the uredospores, other spores, entirely different, are produced. These are stalked, seldom if ever round, are more than one-celled, and are known to botanists as the teleutospores; and these in turn are supposed to produce in the first plant the cluster-cup condition. Such, in brief, is the history of the Wheat-rust, which originates as a cluster-cup on the Barberry-bush, and exists in the other two forms (uredospores and teleutospores) in the Wheat-plant. The principal difficulty in the application of these established biological facts to the Wheat-rust as known in this country lies in the circumstance that the Barberry is by no means a very common shrub, while Wheat-rust is exceedingly common. Hence, we may conjecture that our Wheat-rust is another species than that of Europe, and that it finds its cluster-cups on some other host than the Barberry-plant. So different are these three stages that the cluster-cup on the Barberry was long supposed to be a distinct species of fungus, which was known as *Æcidium Berberidis;* the second stage was supposed to be a distinct species also, and was known as *Uredo rubigo* or *Trichobasis rubigo-vera;* and the third, as *Puccinia graminis*, by which name the whole species is now collectively called. This example may suffice for our discussion of the rusts, but there is reason for thinking that the rusts known as Rose brand, Burnt brand, Bramble brand, Raspberry brand, and Strawberry brand all go through essentially parallel stages. It may be well to add, however, that the *Peridermium columnare* which infests the Fir forests of Central Europe is now known to produce its teleutospores in the *Vaccinium Vitis-Idæa*, a low, worthless shrub which grows among the Fir trees. Hence, to destroy the tree-pest we have but to destroy the *Vaccinium.*

The *white rusts* (so called) might well enough, so far as their reproductive processes are concerned, be grouped along with the moulds, which we shall describe farther on. A favorite place for these white rusts is upon plants of the Mustard family, though they are not confined to them. The appearance of white rust upon the leaves and stems of the Shepherd's Purse has been compared to streaks of whitewash. It comes in the United States upon such plants sometimes as early as in June. When the white blotches appear, the plants become swollen and blistered at the points where the vesicles are; a copious network of fine, white, jointed threads runs through the tissue of the host-plant, and may appear in what seems to be perfectly healthy tissue. At various points along these jointed threads, expanded suckers (haustoria) develop, whose function is to appropriate from the host-plant the nutriment upon which the parasite lives. If we examine the white spots with the microscope, threads will be found upon the surface of the host-plant, and it is the felting of these threads which gives the white appearance. Certain of the threads are upright, and bear on their tips round, spore-like bodies, which, without any union with other bodies, are capable of reproducing white rust like that from which they spring. These conidia, or spore-like bodies, produce in their interiors other smaller round bodies (zoospores), which finally escape from the conidia, and after a period of rest begin a rapid motion through the water (in which they must be immersed for growth); and these conidia remain undeveloped until a shower furnishes the condition under which the little animal-like zoospores may be produced in the conidia; and these afterwards reproduce the mould. This may be called the non-sexual reproduction, and always occurs on the exterior of the host. Another mode of reproduction is now well known. First, round yellowish or brownish, or even black bodies, just visible to the naked eye, may develop on one of the branches of the thread which ramify in the interior tissues of the host-plant. These are the *oogonia*, or female reproductive organs. Associated with them in the interior of the host are smaller transparent, somewhat curved or club-shaped bodies, which (as male) unite with the oogonia. The result is, that the oogonia take on a harder surface-membrane to enable them to resist destruction whilst the tissues of the plant which surround them decay. By spring or late winter these oogonia are thus liberated, and (again in water) zoospores are sometimes formed by the matured and divided contents, which after a brief activity again reproduce the species, as did the zoospores derived from the conidia. This is the sexual mode of reproduction. We do not yet know how many generations may be produced by the non-sexual method before a return to the sexual is required. The rapidity with which such pests are reproduced, especially by the non-sexual method, is almost beyond conception.

Moulds.—The moulds have essentially the same non-sexual and sexual methods of reproduction as the white rusts. Like them, too, they are found both within the interior and upon the exterior of living plants. Unlike the white rusts, the moulds have actually influenced human history by the destructive famines which they have induced and by the political changes which have grown out of such famines. Thus the Potato-rot which appeared in the Isle of Wight in August, 1845, in a week was in England, and in September was in Ireland, and then a little later in Scotland. The mould first invades the leaves and then the stems of the potato, and then again the tubers, until, after various stages of disease, the final condition is fitly expressed by the word "rot." The light cobweb-like mass which comes on the surface is made up of branching threads, of which the erect ones bear on their branching tips an ovoid transparent conidium, so small as to be invisible to the naked eye, but which has essentially the same history as the conidia in the white rust. This will be recognized as the non-sexual mode of reproduction. The sexual mode is also essentially like that seen in the white rust. The final discovery of the oogonia (or, to speak more strictly, the oospores) in the potato-leaf may give us a clue to the means of preventing the spread of the disease. If, as appears probable, there exists an absolute necessity for a return to the sexual mode of reproduction after an interval of greater or less length, it would seem that the systematic destruction by fire of the potato tops and leaves after they had done their work would effectually limit the disease. After the famine caused in Ireland by the *Peronospora infestans* (Potato-rot or Potato-mould) had passed, the island by starvation, by disease, and by emigration had lost one-fourth of its population.

Lettuce-mould, Onion-mould, Grape-mould (which last has been so terribly destructive in the vineyards of Germany, France, and Italy) all bear a close general resemblance to the Potato-mould.

The next division to consider is the *blights* proper, as understood by botanists—the *Erysiphei*. They are also known as *white mildews*. They are mostly parasitic plants, composed of jointed threads, which ramify on the leaf and stem surfaces of the plants they attack, and obtain nourishment by means of their haustoria, which project from the side next the host-plant. It is not certainly decided whether these haustoria penetrate the epidermis and enter the cells, or not. On the upright threads appear chains of conidia, each individual spore of which is capable of germinating. This is clearly a non-sexual mode of reproduction, and occurs in the spring or summer.

The sexual reproduction takes place later in the season. The tips of a pair of these threads come in contact and produce two lateral threads, one of which develops (after contact with the other) into a roundish body, from the base of which threads branch, surrounding it with a protecting envelope known as the perithecium. The whole body is now of a brownish color, and is often large enough to be visible to the naked eye. It is surrounded sometimes at the base by another ununited set of radiating appendages, which make it a very striking object for the microscope. In the interior there is first formed a roundish body, which is now cut off by a partition from the rest of the fungus, and in this body the spores form. Such, in general, is the life-history of the white moulds, but there are several modifications of the type, adapted to, or due to variations in the place of growth, and these variations are often marked by variations in the means of reproduction; but for such forms as most concern us the above description will answer tolerably well. The *Eurotium*, which often grows in bread and preserved fruit or on other objects in a semi-decayed condition, is saprophytic instead of parasitic, as those are which live on growing plants. Among the injurious representatives of the white mildews or blights are the *Sphærotheca pannosa*, which destroys the leaves and flowers of Roses and of wild Gooseberries; *Sphærotheca castagnei*, which injures the Hop-vine; *Uncinula spiralis* (to one condition of which the name *Oïdium Tuckeri* has been given), which here and in Europe is destructive to the Grape. The white cobweb coating we find on the leaves of the Lilac during summer represents the non-sexual reproduction of *Microsphæra Friesii*. Its sexual growth can be found on the same leaves in late summer or early autumn, and may be recognized by black spots which indicate the ripening perithecia. *Erysiphe martii* is found injuring the growth of cultivated Peas. The Hazel, Ironwood, Dogwood, Willow, Red and Silver Maples, Oak, and Virgin's Bower all have representatives of this group of blight upon them. Besides the above, we may here refer to the Black-knot, an excrescence on Plum and Cherry trees caused by a fungus known as *Sphæria morbosa*. This belongs to the group of fungi which produce their spores in sacs, just, indeed, as do the *Erysiphei*, though it is never known popularly as a *white* mildew. In early spring the cobweb-like mass found growing on the knot, if examined, will be found to have on the tips of the upright threads certain microscopically small, oval *conidia*, which represent the non-sexual reproduction. The mature spores are found in their *asci* or sacs in the knot in February. To destroy this fungus, which originated in this country, and which as yet is unknown in Europe, all diseased branches should be cut off and burned. The curculio is not, as is generally supposed, the cause of the Black-knot, but simply utilizes the knot already formed. For our knowledge of the history of the Black-knot we are indebted to Prof. Farlow of Harvard University. We are also indebted to the same author for a study of the fungus (*Fumago salicina*) which infests the Olive and Orange trees of California. The so-called Black-spot which infests the Roses may be the *Sphærotheca pannosa*, or occasionally a species of *Venturia*.

Among the recent discoveries none promise to be of greater importance to fruit-growers than those of Prof. T. J. Burrill. He claims to have found that Pear-blight, or Fire-blight, Apple-blight, and possibly other blights, are caused by the microscopic organisms known as bacteria. These are closely related to the so-called disease-germs which are believed to lead to disease among men and lower animals. Prof. Burrill further claims to have observed the organism, and to have learned how it operates upon the diseased plants, and also to have shown that it is capable of propagating disease by inoculation.

For what is now known of the life-histories of these minute organisms the world is more indebted to Prof. A. de Bary of Germany and the Tulasnes of France than to any other observers; and one can hardly as yet estimate how prolific of good the researches inaugurated by these gentlemen will be in at last giving a clue to the means of eradicating, or at least checking, the spread of those pests which are here treated of collectively under the name of BLIGHT. (J. T. R.)

BLIND, Karl, a German political agitator and author, was born at Mannheim, Sept. 4, 1826. He was well educated, and studied jurisprudence, literature, and philosophy at the University of Heidelberg, and afterwards at Bonn. While still a student he was active in the Liberal movements, and became obnoxious to the Government of Baden. Having taken part in the republican rising in Carlsruhe in the spring of 1848, he was banished from Germany. Taking refuge in Alsace, he was soon charged with fomenting discontent in Paris, and was again banished. Returning to Baden, he joined in a second rising, and after the battle of Staufen was captured, tried by court-martial, and condemned to eight years' imprisonment. Before the end of one year the army had revolted, the grand duke fled, and Blind was liberated. A democratic government being established, he was sent as envoy to the French Republic, of which Louis Napoleon was then president. A revolutionary demonstration in favor of a Roman republic having taken place in June, 1849, in Paris, Blind was charged with encouraging it, and was arrested. After a detention of two months he was expelled from France, and took up his residence at Brussels. He continued the work of agitation, and in 1852, being obliged to leave Belgium, he established himself in London, where he still resides. His labors there have been devoted to influencing public opinion through the press and occasionally by lecturing. He has advocated the cause of nationality in its application to the various countries of Europe. He is a frequent contributor to the leading magazines and reviews of England and America.

BLIND, American Institutions for the. The justice of providing for the instruction and mechanical training of the blind has been vindicated by its remarkable success. From the time of Haüy, who established the first institution in Paris in 1784, their education has only been a question of methods, with the means necessary to carry them into effect.

See Vol. III. p. 917 Am. ed. (p. 826 Edin. ed.).

The loss of sight brings a compensation of increased strength in the other senses and faculties. The touch becomes extremely sensitive by the constant habit of determining the forms of external objects by the finger. By the same law the memory of the blind is very retentive and the hearing more acute. We find in this the key to their facility in learning, and the obvious means to meet it by providing books printed in raised letters and oral instruction by the living voice of the well-trained instructor.

The spirit of universal education which prevails in the United States reaches also the institutions for the blind and deaf-mutes, and this is fostered by the liberal appropriations of every State in behalf of the dependent classes. The good effect of this is noticeable in the increased and growing confidence of the community in the capacity of the blind to take care of themselves and make their way in the world. There are few blind beggars now "by the wayside." With cultivation and scholarship and a knowledge of mechanic arts they acquire self-respect and self-support. It is a gratifying fact that blind persons as a class are industriously inclined. Conscious of their physical infirmity, they ask employment, not alms—an equal chance with others in the battle of life.

The history of the several American institutions for the blind is here concisely stated, the order in which they are presented being that of their origin.

Massachusetts.—*The Perkins Institution and Massachusetts School for the Blind* must be regarded as the pioneer of its kind in America, and may therefore require a more detailed history of its origin. Dr. John D. Fisher of Boston, while in Paris, had frequented the Royal Institution for the Young Blind, the one first established by Valentin Haüy in 1784. On his return in 1826 he consulted with friends on the subject of commencing a school for the blind in Boston, but no definite action took place until Feb. 10, 1829, when a meeting was called. After Dr. Fisher had explained the methods of instructing the blind, a committee was appointed, which reported favorably. An act of incorporation was obtained from the legislature March 2, 1829, under the name of the "New England Asylum for the Blind." Dr. Fisher enlisted the co-operation of Dr. Samuel G. Howe, "who had just returned from the scenes of his philanthropic mission to Greece," and on the 18th of August, 1831, he was appointed superintendent. He proceeded to Europe to visit the principal institutions, and returned in July, 1832, bringing as assistants M. Emile Trencheré of the Paris school as teacher, and Mr. J. Pringle of the Edinburgh institution as master of handicrafts. In Aug., 1832, the work of instruction was commenced with six blind persons. "After five months these pupils had improved sufficiently to be presented to the legislature." In 1833 the General Court appropriated $6000 per annum "for the education of 20 poor blind persons." The interest spread widely to carry on the novel work of instructing sightless persons. Besides the generous donation of Col. Thomas H. Perkins of his mansion and grounds, valued at $25,000, the community contributed $50,000, and the adjoining States of Vermont, New Hampshire, Rhode Island, and Connecticut added appropriations; and thus the Boston institution became the educational establishment for the blind of all the New England States. In 1839 an even exchange of the Perkins estate was made for the Washington House, South Boston, which led to a change of the name to "*Perkins* Institution," etc. In 1840 a department was opened for the employment of the adult blind. The institution enlarged its accommodations by the erection of four cottage buildings for the separate use and instruction of the female pupils, each house accommodating fifteen pupils. The State appropriated $80,000 for this and other improvements.

By the death of Dr. Howe, which occurred Jan. 9, 1876, "the institution lost its lifelong friend and champion." His devotion to the cause of the blind was manifested by his successful efforts in establishing institutions in Ohio, Virginia, South Carolina, and Kentucky. Printing in raised letters was one of the great achievements of Dr. Howe. Through the Boston press the institutions in the United States were first supplied with the books and apparatus necessary for instruction. The press of this institution, recently sustained by a large printing fund, is annually enlarging its valuable stock of embossed books and apparatus for the blind. The other New England States continue their appropriations in proportion to the number of their pupils.

On the death of Dr. Howe, his son-in-law, Mr. M. Anagnos, was appointed director, and has sustained the high reputation which this institution has always enjoyed.

The New York *Institution for the Blind.* Through the benevolent efforts of Dr. Samuel Ackerly and Mr. Samuel Wood the second institution for the blind was incorporated by the legislature of New York. On March 18, 1832, three blind boys were received under the charge of Dr. John D. Russ, one of the managers, who commenced the work of instruction and organization. May 19 three children were added, and the school was opened at No. 47 Mercer Street. In 1833 the institution was located on the present site, Ninth Avenue, between Thirty-third and Thirty-fourth Streets. Dr. Russ projected a phonetic alphabet for the blind, which, however, was not successful. He also introduced the horizontal system of "point-writing," which is still continued by Mr. William B. Wait, the present superintendent. The corner-stone of the present building was laid Dec. 6, 1837; the main building was completed in 1840. Silas Jones, Esq., succeeded Dr. Russ as superintendent. The cost of land and buildings to Sept. 30, 1881, was $234,956. Total number of persons instructed, nearly 1300.

The Pennsylvania *Institution for the Instruction of the Blind.* In tracing the origin of the first three of the American institutions, it appears that the philanthropists of Boston, New York, and Philadelphia were moving by a common impulse for several years before their actual organization. In Philadelphia, as early as 1824–26, Dr. Caspar Morris, Vaux, and others discussed the establishment of a school for the blind, and Dr. Morris was requested to make it "a special object of pursuit." In 1829, Mr. Julius R. Friedlander, who had been connected with an institution in Germany, came to the United States to engage in a similar school. "Among my patients," says Dr. Morris, "was the Marsh family of three blind children. One of them was placed under the tuition of Mr. Friedlander, and the change wrought on him was such that an association was soon organized and funds for its support contributed."

On Jan. 21, 1833, the first meeting for organization was held at the hall of the Philosophical Society, Hon. Peter S. DuPonceau in the chair, John Vaughan secretary. The first meeting of the contributors was held March 5, 1833, when officers were elected, who subsequently confirmed Julius R. Friedlander as principal. Eleven pupils were admitted; a donation of $10,000 was received from Lancaster, Pa.; and a manufactory established for baskets, door-mats, rugs, twine, etc. In April, 1834, the institution had 21 pupils, $20,000 being appropriated by the State. In 1835 a lot was purchased at Race and Twentieth Streets, and a new building, 117 by 55 feet, erected thereon. Removed to new building Oct., 1836; expense of building and lot, $44,896; printing-press set up and a monthly magazine printed in raised letters. A public fair realized over $9000, clear. William Y. Birch died June 2, 1837, leaving a legacy which placed the institution on a stable foundation. The first principal, J. R. Friedlander, died March 17, 1839. The second principal was David B. Tower; the third was Joshua Rhoads, M. D.; the fourth was Rev. John Vaughan, D. D.; the fifth (1846) was Joseph R. Fry; the sixth (Sept. 1, 1849) was William Chapin, A. M., who is still in charge (1883.)

In 1871–72 two large wings were constructed, for which the State appropriated $61,000, making aggregate accommodations for about 240 persons.

New Jersey and Delaware have passed acts providing for their blind in the Pennsylvania institution.

The Ohio *Institution for the Education of the Blind.* Its origin was eminently due to the late Dr. William M. Awl, superintendent of the State lunatic asylum at Columbus. A committee was appointed by the legislature (March 11, 1836) to collect information concerning the blind. Dr. Howe of Boston visited Columbus in Dec., 1836, with three of his pupils, and appeared before the legislature. Great interest was excited, and in April, 1837, an act was passed establishing the institution. Mr. A. W. Penniman, an intelligent blind gentleman, was appointed to organize and take charge of the school, which was publicly opened on the 4th of July, 1837. The school continued in rented houses until a suitable building was erected in 1839. In Dec., 1839, Mr. William Chapin was appointed superintendent, and took charge May 1, 1840. Mr. Chapin resigned from the institution in July, 1846, and was subsequently appointed principal of the institution in Philadelphia.

The Virginia *Institution for the Education of the Deaf and Dumb and the Blind.* Dr. S. G. Howe, in a letter dated March 14, 1837, to Rev. W. S. Plumer, proposed to visit Virginia with some blind pupils, and Mr. F. A. P. Barnard of New York having "proposed to unite the deaf-mutes with the blind, a combined exhibition was given before the legislature in Richmond in Jan., 1838. On the 31st of March an act to incorporate a dual institution of deaf-mutes and blind was passed; $20,000 was appropriated for a site and buildings, and $10,000 for support." "The two schools were established in Staunton, with Rev. Jos. D. Tyler as principal of the deaf-mutes, and Dr. J. C. M. Merrillatt for the blind." On the death of Mr. Tyler, in 1849, Dr. Merrillatt was appointed sole principal.

The Kentucky *Institution for the Education of the Blind.* The first attempt to establish a school for the blind in Kentucky by Mr. Otis Patten, a former pupil of Boston, in 1840, not succeeding, Dr. Howe proposed to go to Louisville and render his services. He was aided by Mr. W. Chapin and others, and gave exhibitions before the legislature in Frankfort, and also in Louisville. On Feb. 5, 1842, the institution was incorporated. A house was temporarily rented and furnished by the ladies, who supported it for several months by the aid of fairs, etc., and on May 9, Mr. Bryce Patten was appointed director, and Mr. O. Patten teacher. On the resignation of Mr. B. Patten some years later, Mr. B. B. Huntoon was elected superintendent. In addition to his other duties, Mr. Huntoon zealously and successfully engaged in procuring an appropriation from Congress, amounting to $10,000 per annum, to the "American Printing-house" for furnishing books and tangible apparatus for all the institutions for the blind in the United States, in proportion to the number of pupils instructed in each per annum.

The TENNESSEE *School for the Blind* was originated by Mr. James Champlin, a pupil from Ohio, in 1843. It is governed by a board of State trustees. It was in this institution that Francis J. Campbell, F. R. G. S., the distinguished founder and principal of the Royal Normal College and Academy of Music for the Blind in London, first received his musical instruction under Mr. William H. Churchman in 1844. The Tennessee school is well managed by its present superintendent, Mr. J. M. Sturtevant, who is also blind. A department for the colored blind is about to be established.

The MISSISSIPPI *Institution for Instruction of the Blind.* In 1846, Mr. Jas. Champlin, a pupil of the Ohio institution, visited Mississippi and raised by subscription a small sum of money for the instruction of the blind. Early in 1847, in company with Rev. P. Lane, he organized in a private house in Sharon a class of three, to which three more were added. This little school of destitute blind children, collected by one blind person, who procured the means to sustain it, and taught by another and experienced blind person, was the humble origin of the present institution of that State. In March, 1848, the legislature appropriated $3500 for its support, and it is still sustained by the State with increased appropriations. A new building is now in progress.

The INDIANA *Institution for the Education of the Blind* was founded in 1847 by Mr. William H. Churchman, who long continued to be its superintendent, and, though blind, was very successful in its management. It receives all the blind without charge. It is liberally provided for by the State, and is in excellent condition. It is governed by a board of trustees.

The NORTH CAROLINA *Institution for the Deaf and Dumb and the Blind* was founded in 1848. It is supported by the State, and is in a good condition. It has also a department for the colored blind, with 21 pupils.

The ILLINOIS *Institution for the Education of the Blind.* This institution owes its origin to Mr. Samuel Bacon, a former blind pupil of the Ohio institution, a student of Kenyon College, Ohio, and a superior mathematician. Leaving Ohio for the West, he stopped at Jacksonville, Ill., where the citizens requested him to start a school for the blind. He commenced in April, 1848, to procure statistics, books, etc., and on June 1, 1848, a school was opened with four pupils under Mr. Bacon's charge. These pupils were exhibited before the legislature Jan. 13, 1849, and the impression was so favorable that an act establishing the institution, under a board of trustees, was passed at once. Mr. Bacon was appointed superintendent. The number of pupils increased; a building was erected, which a few years later was burned; a new building was soon after erected. On the resignation of Mr. Bacon, Dr. Joshua Rhoads was appointed superintendent.

The WISCONSIN *Institution for the Education of the Blind* originated in 1849 in a school of blind children supported by private donations. In Feb., 1850, an exhibition of the attainments of these children was given before the legislature, which adopted the school, appointed trustees, and made an appropriation for its support. This continued until 1881, when a State board of supervisors was appointed over this and all other institutions in the State. From 1856 to 1861, Mr. William H. Churchman, a former pupil in the Pennsylvania institution, was superintendent, during which period a permanent building was erected and the school well organized. "From 1861 until his death in Feb., 1875, Mr. Thomas H. Little was superintendent, under whose efficient labors the number of pupils was largely increased and a high scholarship attained." After his death his wife, Mrs. Sarah C. Little, was appointed superintendent, and continues to manage it with much ability. The building was destroyed by fire in 1874, and a new one was finished in July, 1877.

The SOUTH CAROLINA *Institution for the Education of the Deaf and Dumb and the Blind*, a dual institution, was founded by Rev. N. P. Walker in 1849. The blind are few in number, hence the separation, so desirable, has not yet been made. The methods of instruction have no similarity, and all instructors of the blind disapprove of the union, if possible to avoid it.

The MISSOURI *Institution for the Education of th Blind.* The originator of this institution was Mr. Eli W. Whelan (blind), a graduate of the Pennsylvania institution, in 1851. For nearly three years it was a private school, maintained by donations, but in 1853 a charter was obtained, and it became a State institution in part. The State appropriated $15,000 for five years, the citizens raising $5000 in addition. It afterwards became a State institution entirely, and State trustees were appointed. Nearly $250,000 has been expended by the State for buildings and improvements.

The LOUISIANA *School for the Blind.* In 1852, Mr. John W. Richardson, a blind gentleman, prevailed on his brother, a State senator, to bring in a bill appropriating $10,000 for the instruction of the blind. Pending this bill, Mr. James S. Brown, a teacher of deaf-mutes, urged a larger appropriation, to embrace that class also, which was accepted. In 1858 a large building was completed for the double organization. During the Civil War the school was suspended and the building used as a Federal hospital. In 1859 it was reorganized with both classes. Rev. P. Lane, an intelligent blind gentleman, was appointed in charge of the blind department Jan. 1, 1860. By his efforts an act of the legislature separated the two departments, and the school for the blind was organized in a separate building. In 1873, Mr. Lane was confirmed as principal, and the school assumed a more successful condition. Its effective work, however, dates from April, 1877.

The GEORGIA *Academy for the Blind.* In the spring of 1851, Mr. Walter S. Fortescue, a distinguished pupil of the Pennsylvania institution and a graduate of the University of Pennsylvania, visited Milledgeville and Macon, and secured the aid of many leading citizens in an attempt to found a school for the blind. When the necessary books and apparatus were procured, the contributors met, July 4, 1851, and elected a board of trustees, and Mr. Fortescue was appointed principal. A suite of rooms was rented, and he collected four blind children for such rudimentary instruction as would satisfy the legislature at its meeting in December of the importance of establishing a State institution. On the last night of the session (1852) the bill was passed, "and thenceforward its career of usefulness and prosperity was all that could be desired." "The institution is building a department for the colored blind at a cost of $10,000, with a capacity for forty pupils."

The MARYLAND *Institute for the Instruction of the Blind.* Previous to its establishment the legislature provided for the education of its blind in the Pennsylvania institution. In Feb., 1850, Mr. Chapin, principal of the latter institution, with twenty-four pupils, visited Annapolis, and exhibited before the legislature the improvement made by the blind from Maryland. An approving resolution was passed by the house of delegates, and a charter was granted in 1853. The institution was opened in Dec., 1854, with authority to receive twenty pupils. The legislature appropriated $5000, and the directors secured a valuable property for $26,300. The direction of the school was confided to Mr. David Loughery (blind), a graduate of the Pennsylvania institution and also of the University of Pennsylvania, to whose efforts its origin and early success were largely due. On the death of Mr. Loughery, J. A. McKinney, D. D., was appointed superintendent. Mr. F. D. Morrison has held the office since 1864. The new building, on North Boundary Avenue, was completed in 1868. The managers have also established a department for the colored blind and deaf-mutes in their former building.

The IOWA *College for the Blind.* Mr. Samuel Bacon, who had successfully established the Illinois institution, resigned, and became an instructor in mathematics in St. Louis, Mo. After two years he decided to commence a school for the blind in Keokuk, Iowa. He collected four children, and commenced the work of instruction in Sept., 1852. Desiring to avoid the influence of party politics, he requested the legislature to place the institution under the management of a corporation. The senate passed such a bill, but the house refused, and it was established as a State institution, with a board of four trustees, in 1853. Mr. Bacon was appointed principal. The institution was removed to Vinton, and occupied its new building Jan. 13, 1876. It is now in a satisfactory condition.

The TEXAS *Institution for the Education of the Blind* was founded in 1856 as a State institution, under control of a board of trustees; the principal is the administrative head, appoints teachers and makes rules, etc., with the approval of the board. It is in a vigorous condition, with ninety-nine pupils and an appropriation of $24,000.

The ALABAMA *Institution for the Deaf and Dumb and the Blind*, a dual institution, was founded in 1858 by the State. Measures are now under consideration for separating the blind as an independent department, which will ensure greater success for that class.

The ARKANSAS *School for the Blind* was organized by the citizens of Arkadelphia in 1859, under Otis Patten, who was appointed superintendent. The school was transferred to Little Rock in Sept., 1868. An industrial department for adult males has recently been opened, separate from the school-pupils. They are received for a limited time to learn trades—a department vitally important for the welfare of that class.

The CALIFORNIA *Institution for the Deaf and Dumb and the Blind* had its origin in a society of charitable ladies of San Francisco, and was opened May 1, 1860. It was adopted by the State, and a board of directors appointed. It was established at Berkeley. The number of blind pupils is thirty-one. The institution is well managed, and liberally provided for by the State. Instruction in handicraft is being introduced.

The MINNESOTA *Institution for the Blind* was founded in 1866, in connection with one for deaf-mutes, and separated from that institution in 1874, though under the same superintendent. In 1881, from the dissimilarity of the two systems of instruction, it was placed under another superintendent, qualified to instruct blind persons. The board of directors is appointed by the governor.

The KANSAS *Institution for the Education of the Blind.* Its organization was provided for when the State adopted its constitution in 1861. It was opened by H. H. Sawyer, Esq., Sept. 10, 1867, with seven pupils, in Wyandotte. The State appropriations are liberal. Its main building will be completed in 1882, at a cost of $35,000.

The PENNSYLVANIA *Industrial Home for Blind Women* was established in 1868 by Miss Frances W. Stevenson, who induced two blind women to become the nucleus of an industrial home. The first meeting to organize a board was held May 14, 1868. A matron was appointed, and the home opened June 14th. Donations were freely bestowed, and a building was purchased in West Philadelphia. A new building now contains over forty inmates.

The NEW YORK STATE *Institution for the Blind.* The New York legislature, April 27, 1865, passed an act to establish an additional institution in that State, which provided for building commissioners and for nine trustees. The institution was located in Batavia, and the sum of $250,000 was appropriated for buildings. July 30, 1868, Dr. A. D. Lord, superintendent of the Ohio institution for twelve years, was appointed superintendent. The school was opened Sept. 2d with forty pupils, and the first term closed in June, 1869, with sixty-four pupils, many of these having been transferred from the institution in New York City. This institution "was founded to furnish instruction to all the blind youth in the State, *except those residing in New York and Kings counties*," who are received in the institution in New York City.

The WEST VIRGINIA *Institution for the Deaf and Dumb and the Blind* was founded by the State March 3. 1870, and is governed by a board of seven regents, appointed by the governor. Of the 108 pupils, 78 are deaf-mutes and 30 blind.

The NOVA SCOTIA *Institution for the Blind*, at Halifax, was founded on the munificent bequest of William Murdoch, Esq., a former resident, who left £5000, on condition that an equal sum be provided by other means; which was soon after subscribed. It was established in 1871. Miss Mary Dwyer, a blind young lady of the Pennsylvania institution, thoroughly acquainted with its methods of instruction and female handicraft, was appointed its first instructor in charge. Its support is mainly by the province.

The ONTARIO *Institution for the Instruction of the Blind*, at Brantford, Canada, was opened in 1872. It is supported by the legislature, but is more immediately controlled by the inspector of prisons and public charities, who receives the annual report of the principal, which is included with others in his own report to the Government. He has authority also to make by-laws for the government of the institution, an entire new code of which has recently been established. His duties seem to partake partly of those belonging to our boards of State charities, and partly of those confided to the managers and trustees of the institutions in the United States.

The NEBRASKA *Institution for the Blind.* Mr. S. Bacon visited Nebraska in 1873, and, encouraged by his success in establishing the Illinois and Iowa institutions, at once decided to make a similar effort in Nebraska City, which was successful. On Sept. 22, 1874, the legislature made an appropriation of $18,000 for a lot and buildings for the accommodation of fifty pupils. A board of trustees was appointed Jan. 13, 1875, which was the date of its organization. Mr. Bacon was elected principal. Some legal difficulties having arisen as to the real character of the institution, whether it was an asylum or an educational institution, the supreme court, it is said, decided it to be an asylum. Mr. Bacon vacated his charge in Nov., 1877.

The PENNSYLVANIA *Working Home for Blind Men*, Lancaster Ave., Philadelphia, was chartered July 23, 1874, for giving employment to adults who are homeless or unable to maintain themselves. The managers are elected by the corporation. In six months the sum of $17,855 was received in donations, and a convenient house and lot were purchased, and are now paid for. At present sixty blind adults are employed in the large workshops. The number of brooms made in the year 1881 was 175,000, and about $6500 paid in wages. For the first six months in 1882, 120,000 brooms were made, besides brushes and other wares. These figures demonstrate the ability of the blind for handicraft employment when the opportunity is given; they prefer industry to idleness.

General Remarks.—In a convention of "American instructors of the blind," held in Ohio in 1878, a statistical report was presented by the writer which gave the following interesting results: Former pupils who have become superintendents of institutions, 16; instructors in literature and science, 184; graduates of colleges, 36; ministers of the gospel, 34; authors, publishers, and lawyers, 24; physicians and lecturers, 71; teachers on organ and piano, 214; church organists, 69; vocalists and teachers of singing, 85; piano-tuners, 125; composers of music, 12; teachers of handicraft, 19; manufacturers, 895; storekeepers and traders, 277; farmers, 39; at housework (females), 179; at home at machine and plain sewing (females), 581; at homes of employment, 80; unknown, 606; deceased, 431; incapacitated, 118; pupils remaining in the institutions in 1878, 2292; total admissions from the beginning, 8942. The total admissions to date (1883) are probably 10,000. By a general classification of the above graduates the number devoted to mental or literary work was 710; to music and piano-tuning and repairing, 527; to technical work or handicraft, 1111; total, 2348. It will be seen that nearly half of the above number had learned, or were employed in, some useful handicraft or business occupation.

By returns of the U. S. census of 1880, one-half of all the blind in the country are over forty-eight years of age. Allowing for the feeble and decrepit, more than half of the remainder are able to learn some useful handicraft, and be wholly or partly self-sustaining, if received into homes of industry for employment. Their best welfare would be thus secured; health and contentment would be their portion; a higher moral condition would supersede the miserable, idle lives so many of them are now obliged to lead. Another important result would be the healthy relief of the county poorhouses and poor families from the pauperism and support of so many blind persons able to work. No philanthropic citizen can close his eyes to the fact of the neglect and destitution of so large a portion of the adult blind, who would otherwise be able to contribute by their industry to the relief of those on whom they now depend.

Though the schools for the blind in Great Britain give less attention to literary culture and music than those in America, yet much more is done for the adult blind in the workshops established for their employment than in this country. In this respect there is need of a great change in the American institutions for the blind.

Ages of Admission.—While the institutions differ on this point, the usual time of admission ranges from nine to twenty-one years. In many institutions the period of instruction is seven and eight years; in others the term is discretionary. The most important consideration is the selection of that age in which the pupil may be best trained for his future support. That period would probably be between the ages of eleven and nineteen. Many blind children between the ages of six and ten can be instructed in the rudiments at home or in the primary common schools, and are then better prepared to enter the institutions for their special training.

Brief Summary.—The progress of American institutions may be stated as follows:

1. In a period of fifty years, from 1832 to 1882, thirty-three institutions have been established.

2. The raised print first used was the Boston angular lower case, the Glasgow and Philadelphia capitals (in which the first dictionary was printed for the blind in three volumes). These were succeeded by "combined," or capitals and lower case, as generally used. The New York point system has also been extensively introduced. The Braille point, so generally used in Europe (being international), has long been in use here. The "Moon type," favorably introduced for some years in Europe, is now being adopted for the special use of adults, who readily learn this print from its larger size and simplicity, but are unable to trace the small letters in common use. The Lucas and Frere phonetic systems of England have never been used in America. A multiplication of systems of printing in relief is a great waste of means, without adequate advantage to the blind.

3. Of the handicrafts introduced, broom-making has proved to be the most available, and is almost universally adopted. Basket-, mattress-, and brush-making, carpet-weaving, and cane-seating have each a moderate share for males. For females, machine and plain sewing and crochetting are everywhere taught; also cane-seating.

4. Calisthenic and gymnastic exercises are being brought into general use.

5. A great error has manifested itself in locating so many institutions in small towns, where it is extremely difficult to find sale for the manufactured articles, and a consequent restriction in that valuable branch of instruction is the result.

6. It is a creditable fact that of the thirty-three institutions for the blind, nine were originated by intelligent blind graduates.

7. With the growth of all the institutions the increasing facilities of instruction have kept pace. In addition to the usual grammar-school course, many of the pupils have mastered the advanced subjects of the high schools, and thirty-six have graduated with honor in colleges and universities.

The number of pupils in the American institutions in 1881, as reported by them, was 2532. In 1878 the number was 2292; increase in three years, 240.

The average stay of pupils being about six years, the number annually receiving instruction during these three years may be fairly estimated at 3618..

Official Census of the Blind for 1880. Final Count Received Nov. 15, 1882.

Alabama	1,399	Missouri	2,258
Arizona	27	Montana	12
Arkansas	972	Nebraska	290
California	644	Nevada	24
Colorado	104	New Hampshire	412
Connecticut	613	New Jersey	829
Dakota	63	New Mexico	358
Delaware	127	New York	5,013
District of Columbia	164	North Carolina	1,573
Florida	215	Ohio	2,960
Georgia	1,634	Oregon	67
Idaho	6	Pennsylvania	3,884
Illinois	2,615	Rhode Island	300
Indiana	2,238	South Carolina	1,100
Iowa	1,310	Tennessee	2,038
Kansas	748	Texas	1,375
Kentucky	2,116	Utah	136
Louisiana	845	Vermont	486
Maine	797	Virginia	1,710
Maryland	946	Washington	47
Massachusetts	1,733	West Virginia	625
Michigan	1,289	Wisconsin	1,075
Minnesota	448	Wyoming	4
Mississippi	1,071	Total	48,928

The ratio of the blind to the whole population of the United States is 1 to each 1025 persons.

Taking the States of largest populations, the South, North, and West, we have the following results:

Seven Southern States. The aggregate population of Alabama, Georgia, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia is	9,525,906
Number of blind in the same	10,376
Ratio of the blind to the whole	1 in 918
Four Northern States. Population of New York, Pennsylvania, Massachusetts, and New Jersey	12,279,963
Total blind in the same	11,472
Ratio of the blind to the whole	1 in 1,072
Six Western States. Ohio, Indiana, Michigan, Illinois, Iowa, and Missouri, total population	13,684,100
Number of blind	12,680
Ratio	1 in 1,079

The averages of *all* the Northern and Western States may be regarded as equal. Foreign statistics show that the southern and Asiatic climates have the largest number of blind. The above figures indicate the same here, but the large number of colored persons in the South may modify this to some extent. (W. C.)

Table showing the Dates and Condition of the American Institutions for the Blind (including Canada).

State.	Superintendent or principal.	Location.	When founded.	Government.	Support.	No. of pupils. M.	Fem.	Tot.	Cost per pupil.	State appropriations.	Ordinary expenses.	Age received.	How long retained.
Alabama	Jos. H. Johnson	Talladega	1858	Trustees	State			15	$224	$3,500	$3,500	8 to 30 yrs.	As req.
Arkansas	Otis Patten	Little Rock	1859	"	"	19	19	38	255	10,000	10,000	6 to 26 "	7 yrs.
California	W. Wilkinson	Berkeley	1860	Directors	"	13	18	31	275	40,000	40,000	8 yrs.	7 y. aft. 12
Colorado	(No report.)												
Georgia	M. D. Williams	Macon	1852	Trustees	"	38	24	62	181	12,000	11,378	8 yrs.	8 yrs.
Illinois	F. W. Phillips	Jacksonville	1849	"	"	85	43	128	270	25,000	28,348	10 "	8 & over
Indiana	W. R. Wilson	Indianapolis	1847	"	"	66	62	128	216	27,676	27,676	9 to 21 yrs.	As req.
Iowa	T. F. McCune	Vinton	1853	"	"	41	53	94	250	[1] 10,000	25,090	5 to 21 "	10 yrs.
Kansas	G. F. Miller	Wyandotte	1867	"	"	24	30	54	207	11,482	11,000	10 yrs.	6 "
Kentucky	B. B. Huntoon	Louisville	1842	"	"	47	34	81	250	[2] 10,000	19,000	8 "	7y as ne'd
Louisiana	P. Lane	Baton Rouge	1852	"	"			18	300	5,000	5,000	8 to 21 yrs.	4 to 9 yrs.
Massachusetts	M. Anagnos	South Boston	1832	Corporation	State & ins.	65	64	129	320	45,000	41,368	10 to 20 "	7 to 8 "
Maryland	F. D. Morrison	Baltimore	1853	"	State	33	30	63	298	[3] 300	18,500	9 to 18 "	8 to 10 "
Michigan	J. F. McElroy	Lansing	1879	Trustees	"	33	28	61	303	18,500	18,500	10 yrs.	8 to 10 "
Mississippi	W. L. Langley	Jackson	1847	"	"	32	17	49	225	8,250	8,250	9 to 21 yrs.	No limit.
Missouri	Jno. T. Sibley	St. Louis	1851	"	"	42	48	90	310	23,000	23,000	9 to 25 "	8 to 10 yrs.
Minnesota	Jas. J. Dow	Faribault	1866	Directors	"	21	15	36	260	8,000	8,000	10 to 25 "	8 yrs.
New York	Wm. B. Wait	New York	1831	Corporation	State & ins.	99	120	219	250	40,557	69,144	7 yrs.	As req.
New York State	A. D. Wilber	Batavia	1868	Trustees	State	86	84	170	245	[4] 37,000	40,000	9 "	"
Nebraska	J. B. Parmelee	Nebraska City	1875	"	"	11	17	28	232	6,600	6,500	9 to 21 yrs.	Not def.
North Carolina	H. A. Gudger	Raleigh	1848	Directors	"	15	28	43	......	32,500	32,500	8 yrs.	As req.
Nova Scotia	C. F. Fraser	Halifax	1871	Trus & corp.	End. & State	15	8	23	180	2,760	4,770	10 to 21 yrs.	"
Ontario, Canada	A. H. Dymond	Brantford	1872	Governme't	Legislature.	81	62	143	200	30,000	30,000	7 to 21 "	"
Ohio	Geo. L. Smead	Columbus	1837	Trustees	State	95	87	182	206	35,371	35,371	8 to 21 "	"
Oregon	C. H. Kaiser	Salem	1872	(No report.)									
Pennsylvania	Wm. Chapin	Philadelphia	1833	Corporation	State & ins.	108	64	172	295	[5] 43,500	56,064	10 to 35 "	7 to 8 yrs.
Pa. Work'g Home	H. L. Hall	W. Philad	1874	"	Chiefly sub.	58	emplyd		......	5,000	5,415	21 & over.	No limit.
Pa. Indus'l Home	Miss S. P. Lloyd	W. Philad	1868	"	Donations	44	fem.	44	140	([6])	5,033	not fixed	"
South Carolina	N. F. Walker	Cedar Springs	1849	Trustees	State	20	39	59	150	8,500	....	10 yrs.	6 to 8 yrs.
Tennessee	J. M. Sturtevant	Nashville	1844	"	"	26	32	58	200	11,600	....	9 to 17 yrs.	No limit.
Texas	F. Rainey	Austin	1856	"	"	51	48	99	249	24,630	24,000	8 to 10 "	Indef.
Virginia	Wm. R. Vaughan	Staunton	1838	Bd. visitors	"	18	16	34	287	20,000	10,000	8 to 10 "	7 yrs.
West Virginia	J. C. Covell	Romney	1870	Regents	"	18	12	30	255	25,000	7,600	8 to 25 "	7 yrs.
Wisconsin	Mrs. S. F. Little	Janesville	1849	Supervisors.	"	38	32	70	258	18,000	18,000	8 to 21 "	No limit.

State.	Manufactures taught.	Piano-tuning.	No. of teachers.	College grad.	Print used.	Branches taught.	Improvements contemplated.
Alabama	No report	No	2	...	Combined print	Usual academy course	New buildings.
Arkansas	Brooms, mattresses, cane-seat'g	Yes	6	2	Line and point	Good Eng. branches	Adult work department.
California	None	......	3	...	Boston type	Usual branches	Industrial department.
Colorado	(No report.)						
Georgia	Brooms, mattresses, cane-seat'g	Yes	7	3	Line and point	General Eng. branch's	House for colored.
Illinois	No report	"	...	...	Line and Braille point	Usual and high school	
Indiana	Brooms, sewing-machines, etc.	"	...	...	Line and N. Y. point	Com. and high school	Calisthenics daily.
Iowa	Brooms, baskets, mattr'ss's, $900	No	12	...	" " "	Gram. and high school.	
Kansas	Estimated $3500	"	10	...	" " "	" "	New building—$135,000.
Kentucky	Brooms, mattresses, cane-seat'g	......	10	...	" " "	General Eng. course	Kindergarten.
Louisiana	Cotton mattresses	......	...	...	" " "	" " "	A home to be established.
Massachusetts	Mattresses, brooms, mats, etc.	Yes	23	3	Bost. line and Braille.	Gram. and high school	Object-teaching
Maryland	Br'ms, matrs., cane-seat'g, $5706	"	11	2	Bost., comb. N. Y. point	Eng. branches, Latin.	
Michigan	Brooms, etc	No	7	...	Line and Braille point	Eng. and high school.	Workshops, etc., erected.
Mississippi	Brooms, mattresses, cane-seat'g	"	6	...	Combined Boston	Eng. school branches.	New building in progress.
Missouri	Brooms, brushes, mattresses	Yes	10	...	Comb. and Braille	Eng. and high school.	
Minnesota	Brooms, etc.	No	5	...	Line and N. Y. point.	Eng and high. br'ches.	
New York	Mattresses, cane-seating, etc.	Yes	[7] 21	([8])	N. Y point and line	Full English course	Gymnastics, music.
New York State	Brooms, etc.	"	12	...	Line and N. Y. point.	Eng br. and high sch.	
Nebraska	Brooms, brushes, cane seating	"	4	...	Line and point.	General Eng. br'nches.	
North Carolina	Brooms, cane-seating, etc.	"	9	...	Line and N. Y. point.	General Eng. course.	
Nova Scotia	Willow-ware, cane-seating, machine-sewing	"	5	...	Boston, Moon, Braille	" " "	Hot-water heating.
Ontario, Canada	Willow-ware, cane-seating, machine-sewing.	"	15	...	N. Y. point, improved	" " branches.	Pipe organ, gymnasium.
Ohio	Br'ms, cane-seat'g, mach.-sewg.	"	17	4	Bost., Moon, N. Y. point	Com., higher, and Lat.	
Oregon	(No report.)						
Pennsylvania	Brooms, brushes, mattresses, carpets, etc., $6851.	"	[9] 19	6	Line and Braille.	Eng. and high school.	
Pa. Workg. Home	Brooms, brushes, carpets, etc., value, $26,408.	......	1	...	....	....	Factory and dwelling enlarged.
Pa. Indus. Home.	Baskets, cane-seating, sewing.						
South Carolina	Brooms, brushes, mats, etc.	No	8	...	Combined line	General Eng. course.	
Tennessee	Brooms, brushes, cane-seating	Yes	8	1	Line and point.	General Eng. br'nches.	A colored department.
Texas	Br'ms, mattr., cane-seat'g, $220	"	10	...	Line and N. Y. point.	Eng. and high school.	
Virginia	Br'ms, mattr., cane-seat'g, $640	No	10	1	Boston type	Gram. and high school.	
West Virginia	Br'ms, mattr., cane-seat'g, $478	"	4	...	Boston line, N. Y point	Com. sch. and high'r br.	
Wisconsin	Carpets, cane-seating	......	8	1	Bost type, N. Y. point	Gen Eng and high sch.	Kindergarten.

[1] And — per pupil.
[2] And $140 per pupil.
[3] Per capita.
[4] County, $4700.
[5] From New Jersey and Delaware, $4197.
[6] Few and small.
[7] And 21 tutors.
[8] "Several."
[9] And 19 tutors.

BLOCK, Maurice, a French statistician and political economist, was born in Berlin, Germany, Feb. 18, 1816. He was taken to France when five years old, and naturalized there. He was connected with the bureau of statistics in the ministry of agriculture, commerce, and public works after 1843, and was made chief assistant in it in 1853. Leaving his position in 1861, he has since devoted himself to literary work. Among his numerous publications on statistics and political economy the most important are—*Des Charges de l' Agriculture dans les divers Pays de l' Europe* (1850), which was crowned by the Institute and the Society of Agriculture; *L' Espagne en 1850, tableau de ses Progrès les plus récents* (1851); *Du Commerce des Grains* (1854), translated from the German of Dr. G. Roscher; *Statistique de la France comparée avec des divers États de l' Europe* (1860; 2d ed. 1874); *Puissance comparée des divers États de l' Europe* (1862), which has been translated into several languages; *Les Finances de la France depuis 1815* (1863); *L' Europe, politique et sociale* (1869); *Les Théoriciens du Socialisme en Allemagne* (1872); *Petit Manuel d' Économie pratique* (1872), which was crowned by the French Academy and has been translated into ten languages; *Traité théorique et pratique* *de Statistique* (1878), which has been translated into German, Italian, and Spanish; *Entretiens sur l'Administration du Pays* (1879–82), ten little volumes giving popular information on France, its departments and communes, Paris, the budget, taxes, agriculture, manufactures, and commerce; and *La Quintessence du Catheder-socialisme* (1882). He has edited *L'Annuaire de l'Économie politique* since 1856, making now twenty-six volumes. In the earlier volumes the name of M. Guillaumin, the publisher, was joined with that of M. Block on the title-page. He also edited *L'Annuaire de l'Administration française* (1858–68), making eleven volumes. In 1855 he published *Le Dictionnaire de l'Administration française* (1862; 2d ed. 1876); afterwards *Le Dictionnaire général de la Politique* (1865; 2d ed. 1874); and the *Bibliothèque de l'Administration française.* He has contributed frequently to *Le Temps*, and in recent years to *Le Journal des Débats.* More elaborate articles from his pen have appeared in *Le Journal des Economistes* and in the *Revue des Deux Mondes.* In 1861 he obtained from the Academy of Sciences the Montyon prize for statistics, which had not been bestowed for four years previous. He is a member of the Legion of Honor and has received twenty foreign orders. In April, 1880, he was elected a member of the Institute, Academy of Moral and Political Sciences.

BLOOMINGTON, the county-seat of McLean co., Ill., is 125 miles S. S. W. of Chicago and 156 miles N. N. W. of St. Louis. It is on four railroads—the Chicago and Alton, the Indiana, Bloomington, and Western, the Illinois Central, and the Lake Erie and Western. It has a fine court-house, which cost $100,000, a city-hall, and the county prison. There are seven hotels, three national banks, two other banks, three daily and eight weekly newspapers, twelve churches, and as many schools. It is the seat of the Illinois Wesleyan University, founded in 1857. A little distance to the north of the city are the Illinois State Normal University and a soldiers' orphans' home. Bloomington also contains a female college and a Catholic academy. Besides the large car-works of the Chicago and Alton Railroad and furnaces and foundries, it has manufactures of trunks, brushes, watches, furniture, and stoves. The city was settled in 1833, and has grown steadily. It has two parks, an excellent supply of water, a street railway, and well-paved streets lighted with gas. Its property is valued at $3,781,000, its public debt is $162,000, and its entire expenses for the year 1881 were $129,000. Population, chiefly of American birth, 17,180.

BLOOMINGTON, the county-seat of Monroe co., Ind., is on the Louisville, New Albany, and Chicago Railroad, 51 miles S. W. of Indianapolis. It has a court-house, jail, national bank, 11 churches, an excellent high school and other public schools, and is the seat of Indiana State University, organized in 1829. It has a machine-shop, plough-factory, two furniture-factories, three stave-factories, a chair-factory, two spoke-factories, a woollen-factory, a large tannery, and two grist-mills. Population, 2756.

BLOOMSBURG, the county-seat of Columbia co., Pa., is on the North Branch of the Susquehanna River, 22 miles above the junction of the two branches at Northumberland, and on the Bloomsburg division of the Delaware and Lackawanna Railroad. It has two hotels, an opera-house, three banks (one national), four weekly newspapers, ten churches, good public schools, and a State normal school. It has three iron-furnaces, three foundries and car-works, besides other industrial works. It is lighted with gas and supplied with water by a private company. It was laid out in 1803 and incorporated as a town in 1872. Population, 3702.

BLOSSBURG, a town of Tioga co., Pa., is on the Tioga River, 33 miles N. of Williamsport, and on the Tioga, Elmira, and State-Line Railroad, the Blossburg and Corning Railroad, the Arnot and Pine Creek Railroad, and the southern branch of the Fall Brook Coal Company's Railroad. It has three hotels, a weekly newspaper, six churches, an academy, a graded school and other schools. It has a glass-factory, two saw-mills, a large tannery, a car-shop, a machine-shop, a boiler-shop, a foundry, a flouring-mill, and two planing-mills. It is the centre of the Blossburg semi-bituminous steam-coal region. It is 1400 feet above tide-water, and has mineral springs. Population, 2140.

BLUEBIRD, a species of the genus *Sialia*, family *Turdidæ*. There are at least three species of bluebirds, all confined to North America: 1. The Eastern or Wilson's, *S. sialis*, is one of the most abundant and familiar of the birds of the Eastern United States. It is brilliant blue above, with cinnamon-brown breast and white abdomen; arrives early in the spring and is noted for the melody of its song; nests in holes and lays five or six pale-blue eggs. 2. The Western or Mexican, *S. Mexicana*, occurring from the Plains to the Pacific, is very similar, but has a large brown patch in the blue of the upper parts. 3. The Arctic, *S. arctica*, is of a paler blue above, and mostly white below; it inhabits Western North America with the last. All three are very similar in appearance and habits. (E. C.)

BLUE LAWS, a name given to a fictitious code said to have existed among the early settlers of Connecticut. As far as it is known, the name was first used in print in 1762 in a pamphlet entitled *The Real Advantages which Ministers and People may enjoy, especially in the Colonies, by conforming to the Church of England*, and even there it was merely a vague epithet, applied in derision of the religious customs of the Puritans. The term had evidently been in colloquial use for some time previous, and was employed as in *Hudibras*, where the hero's religion is said to have been "Presbyterian true blue." It became fixed in its present meaning by the publication of *The General History of Connecticut from its First Settlement under George Fenwick to its latest period of amity with Great Britain prior to the Revolution. By a Gentleman of the Province* (London, 1781). This curious farrago was written by Rev. Samuel Peters, an Episcopalian clergyman, who has been well characterized by Rev. Dr. E. E. Beardsley, in his *History of the Episcopal Church in Connecticut*, as "notorious for his eventful career as a clergyman and his extravagant and incredible statements as an historian." Always a hot-headed opponent of the Congregationalists, whose ministers were then supported by parish-rates in Connecticut, Peters was especially vehement in his denunciation of the popular movements at the outbreak of the American Revolution, and was obliged to leave his native country. Taking refuge in England, he had his revenge by publishing a history defaming the colony and full of statements as false as that on its title-page about the first settlement. He professes to give only specimens of a vast multitude which he says were "properly termed Blue Laws—*i. e.*, bloody laws—for they were all sanctified with excommunication, confiscation, fines, banishment, whippings, cutting off the ears, boring the tongue, and death." He adds further that "similar laws still [that is, in 1781] prevail over New England as the common law of the country." Of his forty-five specimens, the following are the most characteristic: "No one shall be a freeman or give a vote unless he be converted and a member in full communion of one of the churches allowed in this Dominion. No food or lodging shall be afforded to a Quaker, Adamite, or other heretic. No priest shall abide in this Dominion; he shall be banished, and suffer death on his return. Priests may be seized by any one without warrant." The laws relating to Sunday are given as follows: "The Sabbath shall begin at sunset on Saturday. No one shall run on the Sabbath day, or walk in his garden or elsewhere except reverently to and from meeting. No one shall travel, cook victuals, make beds, sweep house, cut hair, or shave on the Sabbath day. No woman shall kiss her child on the Sabbath or fasting day." Perhaps the most famous of these fictitious laws is this: "No one shall read

Common Prayer, keep Christmas or saints' days, make minced pies, dance, play cards, or play any instrument of music except the drum, trumpet, and Jews' harp." The last is one of the most absurd: "Every male shall have his hair cut round, according to a cap;" and Peters takes care to add that this is contrary to the Levitical law. Besides the laws themselves, Peters professes to give instances of their enforcement, such as that in 1750 an Episcopal clergyman was complained of by the grand jury, tried, and fined for several violations of the Sabbath, which consisted in combing a lock of his wig, humming, walking too fast from church, running into church when it rained, etc.

A professed history containing such curious statements was very acceptable to those who were prejudiced against the Puritans, and some of these Blue Laws were quoted even by respectable writers as genuine specimens of New England legislation. Another matter that has caused misapprehension on the part of some investigators is the fact that in 1636, Rev. John Cotton of Boston, having been requested to assist the magistrates of Massachusetts Colony in preparing a code of laws, drew up and presented *A Copy of Moses his Judicials*, compiled entirely from the Old Testament and retaining the very language of the Scriptures. Though these never were adopted by any colony, they were printed at London in 1641 under the false title of *Abstract of Laws of New England.*

In 1636 the government of the Connecticut colony determined that "the magistrates should administer justice according to the laws here established, and for want thereof according to the word of God." New settlers who should take the oath of fidelity were to be admitted to the full rights of citizenship by a vote of the majority of the town, church-membership not being expressly required. In 1642 the General Court, following the example of Massachusetts, established the following as capital offences: Idolatry, witchcraft, blasphemy, murder, bestiality, sodomy, adultery, rape, man-stealing, false witness to take away life, and treason. According to the custom of the time, of which examples may be found in Coke, and afterward in Blackstone, Scripture-texts were quoted to confirm the statutes. The first code was adopted by the General Court May, 1650, and appears to have been compiled by Roger Ludlow. It was founded chiefly on the code of Massachusetts, which had been printed in 1648; other provisions were taken from the previous orders of the General Court. In them there are traces of the stern vindictive character of the age to which they belonged. To the capital offences before enumerated it was added that stubborn and rebellious sons above fifteen years of age might, on the complaint of their parents, be put to death, and this law was sanctioned by a reference to Deuteronomy. So also in the case of a child of that age who had smitten father or mother. For burglary or highway robbery the punishment for the first offence was branding on the forehead with B, or if the crime were committed on the Lord's Day the offender should lose one of his ears; a second offence should be punished in the same way; and for a third offence the criminal should be put to death as incorrigible. Trial by jury was established, but in civil cases, at least, the verdict might be rendered by two-thirds of the jury. For the support of the ministers of the gospel it was provided that citizens should be called upon to subscribe for that purpose, but "if any man refuse to pay a meet proportion, that then he be rated by authority in some just and equal way;" and this rating was to be considered a debt. All persons were required to attend the stated exercise of worship on Sunday and fast-days, under penalty of five shillings. Tobacco was not to be used by any persons under twenty years of age; every public use of it was fined sixpence. Yet, taken as a whole, these laws display a better understanding of the rights of individuals and of the needs of society than any European legislation for a century later.

New Haven was settled in 1638 by a colony under Rev. John Davenport, together with Theophilus Eaton and Edward Hopkins, who had been wealthy London merchants. The fundamental agreement, made by the "free planters" June 4, 1639, declared that "the Scriptures set forth a perfect rule for the government of commonwealths," and all present held themselves bound by rules made in accordance therewith. They agreed that "free burgesses should be chosen out of members of some one of the approved churches of New England." This rule was enforced when other towns combined with New Haven. In 1656 there was published in London a volume called *New Haven's Settling in New England, and some Lawes for Government; Published for the Use of that Colony.* These laws had been adopted at various times by the General Court, but were revised and digested in 1655, and ordered to be printed in England. They are in the main similar to those of the Hartford colony, yet there is perhaps a more marked endeavor to give the colony of New Haven a religious character. Among the additional laws may be noted one which orders that heretics who "go about to subvert the Christian faith or religion," if they "continue obstinate therein after due means of conviction, shall be fined, banished, or otherwise severely punished." This code was reprinted at Hartford in 1838, under the title *The Blue Laws of New Haven Colony, usually called Blue Laws of Connecticut. Compiled by an Antiquarian.* The compiler was Hon. R. R. Hinman, then secretary of state. The title indicates that the publication was intended to justify and support the old charges about the Blue Laws, yet it really proves that there is no truth in the most striking features of Peters's travesty of the early legislation.

The records of the courts of the early settlements of Connecticut have been preserved and published, but there is little mention in them of the infliction of death or of severe or unusual punishments. Heresy was punished by banishment; in 1657, Quakers and Ranters were prohibited from coming into the jurisdiction of New Haven. In 1691 the new charter gave liberty of conscience to all except papists. The law imposing a fine for neglect of public worship was repealed in 1770.

It cannot justly be said that Connecticut owes its prominence as the State of the "Blue Laws" to the greater humanity of the laws of other colonies. With these both her laws and the practice under them compare favorably. Rhode Island and Pennsylvania, however, owing to the enlightened character of their founders, form honorable exceptions. To state correctly the character of the laws of the New England colonies would require a full discussion of the origin, history, and beliefs of their founders. We can here indicate only a few points. The Reformers of the sixteenth century and their followers in the seventeenth looked upon civil government as an institution equally divine with the Church. They believed that God had revealed in the Bible laws and principles for both institutions. These views were applied in one way by the adherents of the various established churches in Europe, and in another by the Puritans in founding their new commonwealths in the wilderness of the New World. Throughout the civilized world at that time there was a disposition to extend the province of public law and to entrench upon the domain of private rights, to compel the individual to submit to society. And when we remember this, and consider the examples of it in the legislation of Great Britain and various colonies, we may rather approve the moderation of the Puritans of Connecticut in their legislation about personal habits and domestic affairs than censure them for error in this respect. In one particular, however, their laws gave frequent offence, and thus laid the foundation for all the odium cast upon the "Blue Laws." The Puritans insisted that the observance of the Sabbath, being required by the Decalogue, was of universal obligation and should be enforced by the civil magistrate. Their opponents, of whatever class, jealous of any infringement of personal liberty, found here an especially favorable point of attack. Down to the present day it is common to stigmatize laws forbidding secular occupations or travel on the first day of the week as "Blue Laws."

As it is frequently supposed that the clergy of that time exercised a tyranny over the community, it may be well to mention that the Connecticut code expressly declared that "church-members may be dealt with by the civil magistrate without interference," and that "civil punishment was altogether independent of church censure." In Massachusetts and Connecticut the people, according to the constitution, took the oath of fidelity to the commonwealth, not to the king. Of course it was impossible to prevent other subjects of the king from coming within their bounds and claiming the liberty of free-born Englishmen, and even calling upon the civil and ecclesiastical authorities of England to enforce here those laws of the mother-country which the original settlers had tried to avoid. In the struggle that ensued one of the most formidable weapons used by the opponents of the colonial authorities was the ridicule cast upon the laws and customs of the Puritans, and this has from various motives been continued to the present day.

See *True Blue Laws*, edited by J. Hammond Trumbull (Hartford, 1876), which gives the several codes of the Connecticut colonies, and Peters's *History of Connecticut*, edited by S. J. McCormick (New York, 1877). (J. P. L.)

BLUFFTON, the county-seat of Wells co., Ind., is on the Wabash River, 24 miles S. of Fort Wayne, on the Fort Wayne, Cincinnati, and Louisville Railroad and on the Toledo, Cincinnati, and St. Louis Railroad. It has a fine public school, six churches, two weekly newspapers, six saw-mills, two planing-mills, two foundries, four flour-mills, a woollen-mill, and a large lumber and cattle trade. Population, 2504.

BLUNTSCHLI, JOHANN KASPAR (1808–1881), a German jurist and statesman, was born at Zurich, Switzerland, March 7, 1808. He was educated at the Political Institute of that city, and afterwards went to Germany, where he enjoyed the instruction of Savigny and Niebuhr. He received the degree of doctor of law from the University of Berlin, and, returning to Zurich, began to lecture on Roman law. He also held a position in the district court, and in 1833 he was made extraordinary professor in the newly-founded University of Zurich. In the political discussions of the time he inclined to the conservative side. In 1837 he became a member of the grand council, and in 1839 of the local government. In 1845 he gave up his position in the Government, and in 1848, in consequence of the triumph of the radical party, he went to Munich, where he was made professor of German private law and international law. Here he also engaged in politics, taking part with the national liberal party in opposition to the absolutists. In 1861 he accepted a call to the University of Heidelberg as professor of political science. He soon became a member of the Parliament of Baden, and in 1863 was appointed a privy counsellor. He exerted himself for the establishment of a German parliament and for liberal reform in the local parliament. He also advocated the cause of religious liberty, assisted in founding the Protestant Union in 1864, and presided over several conventions of German Protestants. In 1866 he strove to secure the neutrality of Baden in the war between Austria and Prussia, and at its close was elected a member of the customs-parliament which prepared the way for a closer union of North and South Germany. He died at Carlsruhe, Oct. 21, 1881. Throughout his career he was noted for his literary activity. His first important publication was *Staats- und Rechtsgeschichte der Stadt und Landschaft Zürich* (1838–39; 2d ed. 1856). After removing to Munich he published *Allgemeines Staatsrecht* (1852; 4th ed. 1868–69); *Deutsches Privatrecht* (1853–54); *Die neuen Realschulen der Juristen* (1859); *Altasiatische Gottes- und Weltideen in ihren Wirkungen auf das Gemeinleben* (1866); *Geschichte des allgemeinen Staatsrechts und der Politik* (1864); *Das moderne Kriegsrecht der civilisirten Staaten* (1866); *Das moderne Völkerrecht als Rechtsbuch mit Erläuterungen* (1868). In conjunction with Brater he began the publication of *Deutsches Staatswörterbuch* (11 vols., 1859–70). He also published a number of smaller treatises on questions of law, history, politics, and international law.

BOARDMAN, GEORGE DANA (1801–1831), American Baptist missionary, was born in Livermore, Me., Feb. 1, 1801. He graduated at Waterville College (now Colby University) in 1822, and at Andover Theological Seminary in 1825. He sailed for Burmah, July 16, 1825, and became distinguished for his missionary devotion and success, winning for himself the honorable title "the Apostle of the Karens." He died amid the Burmese mountains, Feb. 11, 1831.

BOARDMAN, GEORGE DANA, D. D., son of the preceding, and step-son of Adoniram Judson, D.D. He was born in Tavoy, in British Burmah, Aug. 18, 1828; sailed for America at the age of six; graduated at Brown University in 1852, and at Newton Theological Seminary in 1855; ordained and settled as pastor at Barnwell C.-H., S. C., in December of the same year; served as pastor of the Second Baptist Church of Rochester, N. Y., from October, 1856, to May, 1864; became pastor of the First Baptist Church in Philadelphia, where he still serves. He is president of the leading organization of his denomination, the American Baptist Missionary Union. He has published *The Creative Week*, *The Model Prayer*. *Epiphanies of the Risen Lord*, *The Mountain Instruction*, numerous sermons, pamphlets, review articles, etc.

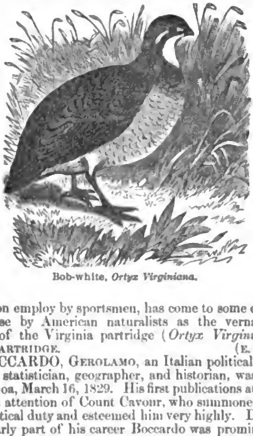
BOARDMAN, HENRY AUGUSTUS, D.D. (1808–1880), a Presbyterian minister of Philadelphia, was born at Troy, N. Y., Jan. 9, 1808. He graduated at Yale College in 1829 as valedictorian of his class, and began the study of law, but after a few months resolved to enter the Christian ministry, and studied theology at Princeton. He was ordained pastor of the Tenth Presbyterian Church in Philadelphia, Nov. 8, 1833, and soon became noted as an impressive and eloquent preacher. When the Presbyterian denomination was divided in 1838, Dr. Boardman, though regretting the disruption. adhered to the Old School branch, of which he became a leader. In 1853 the General Assembly elected him to the professorship of pastoral theology at Princeton Theological Seminary, but the earnest remonstrances of his congregation and of the leading citizens of the community caused him to decline the position. He was then chosen Moderator of the Assembly, and as such preached a famous sermon on *The Christian Ministry Not a Priesthood*. After forty-two years of service he resigned his pastorate, May 25, 1876, but at the request of the congregation remained as pastor emeritus, and preached occasionally. He died at Philadelphia, June 15, 1880. Dr. Boardman had a high reputation as an earnest defender of the Calvinistic doctrines and of the Presbyterian form of church government. a dignified expounder of commercial and professional morals, and an active promoter of charitable institutions. Besides a large number of sermons and pamphlets, he published fourteen volumes, among which were *The Scripture Doctrine of Original Sin*, 1839; *Apostolical Succession*, 1844; *The Bible in the Family*, 1851; *The Bible in the Counting-House*, 1853; *Election*, 1860; *The Higher-Life Doctrine of Sanctification*, 1879; *Earthly Suffering and Heavenly Glory*. 1878. Since his death several sermons preached at the commencement of various years have been gathered into a volume under the titles *Mottoes for the New Year*, 1882.

BOBOLINK (onomat.), a bird of the family of American starlings (*Icteridæ*), the *Dolichonyx oryzivorus*; also known as the reedbird and ricebird. It is noted for the variety and fantasy of its song. the name being an attempt to express the note in a word, and for the great change of coloration which the male undergoes in spring and late in the summer. In breeding plumage, which is acquired without moult, by actual change of color of the feathers, the bobolink is jet black, with buff cervix, and white or ashy on other upper parts.

Bobolink, *Dolichonyx oryzivorus.*

After midsummer the moult occurs, when the male changes to a garb like that worn by the female, chiefly tawny-yellowish, and is then known as the reed- or ricebird, and esteemed a great delicacy for the table. The ricebird winters extra-limital, and returns with great regularity in the spring, proceeding as far north as New England and Canada to breed; it chiefly occurs east of the Mississippi. It lays colored eggs in a well-concealed nest on the ground in meadows, and is usually found in large flocks, especially when migrating in the fall; its favorite resorts are then the *Zizania* tracts along rivers. (E. C.)

BOB-WHITE (onomat.). In consequence of the various confusing applications of the words "partridge" and "quail" to American game-birds of the families *Tetraonidæ* (grouse) and *Perdicidæ* (partridges), the name "bob-white," derived from the note, already in common employ by sportsmen, has come to some extent into use by American naturalists as the vernacular name of the Virginia partridge (*Ortyx Virginiana*). See PARTRIDGE. (E. C.)



Bob-white, *Ortyx Virginiana.*

BOCCARDO, GEROLAMO, an Italian political economist, statistician, geographer, and historian, was born at Genoa, March 16, 1829. His first publications attracted the attention of Count Cavour, who summoned him to political duty and esteemed him very highly. During the early part of his career Boccardo was prominently engaged in the public affairs of his country, but he has in later years given more attention to the work of instruction. He is professor of statistics in the University of Genoa, professor of political economy in the Naval High School, and director of the Technical Institute of the same city. He is still a senator of the kingdom of Italy, member of the council of public instruction, and provincial and communal councillor of Genoa. He is a member of the Royal Academy of Sciences and of various learned societies of Italy and other European countries. Throughout his career he has constantly been engaged in authorship, and has produced a large number of valuable works in different departments of political and physical science. Among those on political economy, commerce, and finance are—*Trattato teoretico-practico di Economia Politica*, which has reached its sixth edition; *Storia del Commercio; Dizionario Universale della Economia Politica* (Milan, 1874); *Note e Memoria di un Economista* (Genoa, 1873); *Diritto Commerciale; Diritto Amministrativo; Trattato di Conhabilita; Le Banche e il Corso forzato* (1879); *Il Riordinamento della Banche in Italia* (1880); *Il Negoziante Italiano* (1881). His principal historical works are *Antichità Romane e Greche; Corso di Storia Universale* (5 vols.); *Feste, Giuochi e Spettacoli.* He has devoted much attention to physical geography; his first work in this department was a study of earthquakes and volcanoes under the title *Sismopirologia.* He afterwards published *Fisica del Globo* (1868), a series of lectures on physical geography delivered in the Naval School. Another important work by Boccardo on this subject, *La Terra e la sua progressiva Conquista*, is similar to the well-known work of his friend Hon. G. P. Marsh, *The Earth as Modified by Human Action.* In still another direction Boccardo has published *Prediche di un Laico.* Besides these separate works he is editor of two great undertakings, *La Nuova Enciclopedia Italiana*, of which fifteen volumes have already appeared, and the *Biblioteca dell' Economista*, which has reached its thirteenth volume. He is a man of versatile talent, encyclopædic attainments, and indefatigable industry.

BODENSTEDT, FREDERICK MARTIN, a German poet, was born at Peine, Hanover, April 22, 1819. He had been intended for a mercantile career, but gave this up and attended the universities of Göttingen, Munich, and Berlin, where he devoted himself especially to literary and linguistic studies. At the age of twenty-two he became tutor to Prince Galitzin in Moscow, and soon after published translations of the poems of Puschkin and Lermontoff (Leipsic, 1843). He then went to Tiflis, where he taught Latin and French, but in 1845 set out on an expedition through the Caucasus. He collected diligently the poetry of the people, and published in 1848 the results of his observations in *Die Völker des Kaukasus.* A still more successful work was his *Tausend und ein Tag im Orient* (1850), but even its success was eclipsed by that of the *Lieder des Mirza-Schaffy* (1851), which was long supposed to be a translation from the Persian, as it professed to be. This work has been translated into most of the languages of modern Europe and into several Asiatic tongues. It is one of the most successful attempts of a European to reproduce the spirit and form of Oriental poetry. Bodenstedt has also published some dramas, among which is *König Anthari's Brautfahrt* (1860), and several volumes of poems and tales. On his return to Germany he had become a journalist, but in 1854 he was appointed professor of Slavic literature in the University of Munich, and in 1858 was transferred to the chair of Old English. He assisted in the production of classic dramas at the court theatre, and in 1866 accepted the invitation of the duke of Saxe-Meiningen to become director of his theatre. He visited the United States in 1879. Besides the works already mentioned, Bodenstedt has translated into German Shakespeare's sonnets and some of his plays. He has also written several novels, among which are—*Vom Hof Elisabeths und Jakobs* (1871); *Aus deutschen Gauen* (1871); *Das Herrenhaus in Eschenwald* (1872). A collection of his earlier works appeared at Berlin in 12 volumes (1865–69).

BODIE, a mining-town of Mono co., Cal., is 6 miles W. of the Nevada line and 100 miles S. of the Central Pacific Railroad. It is on a spur of the Sierra Nevada Mountains, 20 miles east of the main range, and is 8320 feet above the sea-level. Placer gold was discovered here in 1859 by William S. Bodey, and the district was named from him (with a variation in spelling). Though in 1864 gold quartz was discovered, the place was afterwards abandoned until 1877, when the Standard Company commenced operations here. Since that time more than $13,000,000 worth of gold has been produced, and there are in the district thirty-five steam-hoisting works and 164 stamps. Bodie has a bank, hotels, churches, public schools, and a daily and a weekly newspaper. Population, 2712.

BODMER, Karl, an artist, was born at Zürich in 1805. In 1832 he published at Cologne a quarto volume of drawings under the title of *Vallée de la Moselle de Trèves à Coblentz, ou Vues pittoresques dessinées d'apres nature.* These drawings were etched by his brother. In 1833, Bodmer visited America in company with Prince Maximilian von Wied, and penetrated to the country west of the Mississippi. This trip was productive of important results, for Bodmer was the first artist of superior attainments who undertook the delineation of the North American Indians in their native haunts, and the sketches and studies which he made during the trip—many of which have been engraved and published—have at the present time an interest and a value of the highest kind. Bodmer managed to secure records of what was then a wilderness, and of its human and brute inhabitants, which, so far as they go, are superior to any works of a similar kind executed by Catlin. On his return to Europe, Bodmer in 1839 published certain records of his American experiences under the title of *L'Atlas du Voyage dans l'Intérieur de l'Amérique du Nord.* His American sketches and studies also furnished him with the materials for a number of pictures, etchings, and so forth. Bodmer finally established himself in Paris. His first contribution to the Salon was in 1836, and was in the shape of a series of aquarelles entitled Costumes et Personnages Indiens. During recent years he has contributed to *L'Illustration* and other illustrated publications numerous admirable designs executed by the Comté process. He is especially fond of depicting forest interiors, with or without human or brute figures, and few artists have been more successful in delineating the solemnities of vast woodlands. Of this class are Les Feuilles Sèches (1853), Après la Pluie (1857), La Forêt dans les derniers jours d'Automne (1865). But he is equally happy with other landscape subjects, and his human figures, although they seldom rise above the importance of accessories, are skilfully and effectively rendered. Bodmer is frequently quite as dramatic as Landseer, but his beasts and birds are always true to their own brute natures and never suggest humanity. The composition always has the charm of spontaneity about it, and always suggests that the artist has seen and carefully studied what he endeavors to depict. Bodmer's landscape art is so thoroughly admirable that at first glance it is frequently apt to appear of more importance than the living creatures which are represented. A very little study of one of his designs will show, however, that these constitute the real subject of the composition, and that the artist has been successful in depicting some characteristic trait or in treating some definite theme. At the Paris Exposition of 1878 he was represented by a Bouquet de bouleaux and a Ménage de roitelets. Bodmer is a very accomplished etcher, and his plates are highly esteemed by connoisseurs, while he has obtained finer results from the Comté process than almost any other artist who has tried it. This artist has been awarded a number of medals, and in 1876 he was decorated with the cross of the Legion of Honor. (W. J. C., JR.)

BOECKH, August (1785-1867), an eminent German classical archæologist and philologist, was born at Carlsruhe, Nov. 24, 1785; was educated at the Carlsruhe gymnasium and the universities of Halle and Berlin; became in 1807 extraordinary professor, and in 1809 full professor, at Heidelberg; in 1810 was made professor of oratory and ancient literature at Berlin, where he died Aug. 3, 1867. Among his works are *Commentatio in Platonis Minoem* (1806) and notes on other writings of Plato; *Græcæ tragœdiæ Principum* (1808); *Ueber die Versmasse des Pindaros* (1809); the works of Pindar (1811-22), with important notes; a monumental work entitled *Die Staatshaushaltung der Athener* (1817; enlarged 1851); *Metrologische Untersuchungen über Gewichte*, etc., *des Alterthums* (1840); the first 4 vols. of the *Corpus Inscriptionum Græcorum* (1824-62); and several minor works. Boeckh was a man of original and deeply philosophic methods, and despised mere grammatical subtleties and the empty display of learning. He was a patient and zealous collater of facts bearing upon the social, industrial, and domestic aspects of the old Greek civilization, and may be regarded as the founder of the modern school of investigators in Greek history.

BOEHM, Joseph Edgar, a sculptor of Hungarian parentage, was born July 6, 1834, at Vienna, where his father resided in his capacity of director of the Austrian mint. His father was a man of great artistic culture, and owned a large and valuable collection. Boehm began his education at Vienna, but in 1848 he went to England, where he remained until 1851, when he went to Italy to study art. After visiting Italy he took up his residence in Paris. He returned to England in 1862, and appears to have made a great impression on the public from the first by the vigor of his style. He has been a particular favorite with the queen and the members of the royal family, and has executed a colossal statue of the queen for Windsor Castle, a monument to the duke of Kent in St. George's Chapel, and bronze statuettes of the prince of Wales and other members of the royal family. Of the other notable works of Boehm may be mentioned his statue of Bunyan, which was erected at Bedford in 1862, a statue of the duchess of Bedford, a statue of Sir John Burgoyne for Waterloo Place, London, a colossal statue of the prince of Wales for Bombay, a statue of Thomas Carlyle for the Thames Embankment in 1882, monuments to Lord Cardigan and Sir York Scarlett at Deene and Aldershott, an equestrian statue of Lord Napier of Magdala and one of Lord Northbrook for Calcutta, a colossal statue of Sir William Gregory for Ceylon, and a large number of portrait-busts, including one of the late Lord Lansdowne in Westminster Abbey.

BÖGH, Erik, a Danish author, was born Jan. 17, 1822, in Copenhagen, the son of a teacher. He was successively teacher, actor, and portrait-painter, and at length found himself an author of the first rank. As a writer of dramas he became popular not only in Denmark, but also in Norway and Sweden. He has written nearly 100 dramas, which have been published in seven volumes (1858-71). Among the more prominent of these are: *New Year's Eve* (1850); *Witch Hill* (1852); *A Simple Maiden* (1853); *The Caliph on a Lark* (1857); *A Caprice* (1853); *Shrovetide Feast: The Editor's Secretary;* and *The Goodman's Substitute.* He is not very original, his strength lying chiefly in his epigrammatic couplets and in the distinctness of the characters he presents. In the summer of 1855 he received public aid for travelling in Germany and France, and upon his return he was made director of the Casino Theatre, a post which he held for five years. Proof of his poetic talents is also found in abundance in his *Poems* (1855; 4th ed. 1869), his *Hundred Songs* (1862; 3d ed. 1870), and in his *Thirty Songs to the Hundred* (1865), all of which overflow with wit and humor. He is also a prolific prose-writer and humorist, writing in the conservative interest. In this field we find—*Seven Lectures* (1860; 5th ed. 1875); *Jonas Tværmose's Miseries* (1864-75; 3d ed. 1877); *Tales* (1872); *Selected Stories* (1876; 2d ed. 1877); *This and That: Feuilletons* (1860-77); *Master Ole's Sermons* (12th ed. 1876). In 1860, Bögh became editor of *The People's Gazette*, in 1877 of *The Day's News*, and in 1881 he was appointed censor of the national theatre. (R. B. A.)

BÖHLER, Peter (1712–1775), a bishop of the Moravian Church, was born at Frankfort-on-the-Main, Germany, Dec. 31, 1712. He received a classical and theological education at the University of Jena, and, becoming acquainted there with the famous Count Zinzendorf, connected himself with the Church of the United Brethren, which was then revived. He was the first minister ordained by Count Zinzendorf after he became a bishop. Being assigned to labor in America in 1737, he stayed for a time in London to learn the English language, and assisted in forming a society of the Brethren there, preaching and praying in Latin while an assistant interpreted. Charles Wesley had given Böhler some instruction in English, when his brother John was brought to an interview with the pious German, Feb. 7, 1738. This conversation was followed by others, and led to important results in Wesley's life and character. Böhler found the Moravians in Georgia on unpleasant terms with their neighbors, and in 1740 removed them to Pennsylvania. The celebrated Whitefield, who had accompanied them to Philadelphia, gave them employment in building an orphan-house for negro children on a tract of land which he had purchased in Northampton co., Pa. This place was called Nazareth, and for many years Peter Böhler's oak tree was pointed out here. Böhler afterwards returned to London, and preached there for some years, but his intimacy with Wesley was not resumed. Though the latter records in grateful terms his indebtedness to the Moravians, he says expressly that he never felt it necessary to abandon his Church and join them. Besides his labors in England, Böhler at times visited Herrnhut in Saxony, the headquarters of the Brethren, and here he was consecrated bishop in 1748. He continued, however, to reside in London till June, 1753, when the Brethren there became involved in serious financial difficulties. He then came to America, and was Bishop Spangenberg's assistant in the supervision of the American churches. He resided at Bethlehem, Pa., and when Spangenberg departed for Europe in 1762, took charge of affairs. In 1764 he was a member of the Elders' Conference which met at Herrnhut. In 1774 he returned to Europe, and died in London, April 27, 1775.

BOISÉ CITY, the capital of Idaho, is in Ada county, near the Boisé River, 50 miles above its junction with the Snake River and 700 miles N. E. of San Francisco. It is a centre of stage-routes, and is on the Oregon Short-Line Railroad. It has a U. S. assay-office, a fine court-house, a penitentiary, three hotels, a national bank, three weekly newspapers and one tri-weekly, five churches, and a school-house. Two large ditches bring water from Boisé River and furnish abundant water-power. There are two flour-mills, two planing-mills, and some minor industries. The city is 2800 feet above the sea-level, is well shaded, and has a park and water-works. Its property is valued at $1,000,000, its public debt is $50,000, and its yearly expenses $10,000. It was settled in 1863, and incorporated as a city and made the capital in 1865. It is in the midst of a fruit-growing region, with mild climate, and is the centre of trade for the mining regions of Idaho. Population, 1899.

BOKER, George Henry, poet, dramatist, diplomatist, born in Philadelphia, Oct. 6, 1823. His family was of Quaker origin. He graduated at Nassau Hall, Princeton College, in 1842. After travelling in Europe he published *The Lesson of Life and Other Poems* (1847), and in 1848 *Calaynos*, a blank-verse tragedy on a Spanish theme, which had a run of a hundred nights in London, was played in the English provinces, and produced with marked success in the chief cities of the United States. *Anne Boleyn* (1850), *Francesca da Rimini*, and *Leonor de Guzman* were his next tragic compositions. He also wrote two comedies, *The Betrothal* and *The Widow's Marriage*, in verse, the former of which was played successfully, and one prose comedy, *The World a Masque*, which held the stage for some time, but was not printed. His miscellaneous poems are numerous, and as a sonnetteer he has taken especially high rank. In November, 1862, he formed, with others, the Union Club, and in December the Union League, of Philadelphia, to spread loyal opinions and support the Government in its contest with rebellion. Throughout the war he was secretary of the League, and rendered important public services. At this time he wrote various war-poems, which had a wide influence. In 1872 he was appointed by President Grant minister of the United States at Constantinople, and remained there nearly four years, when he was promoted to St. Petersburg. On his return home in 1878 he was elected president of the Union League, and has been chosen to fill that post each year since. In March, 1882, he published *The Book of the Dead*, a series of short poems on one theme.

BOLIVIA. In 1871, Gen. Morales had been elected by the Bolivian Congress as successor (*pro tempore*) to the dictator Gen. Melgarejo. In April, 1873, Don Adolfo Ballivian was chosen successor to Gen. Morales, but dying Feb. 14, 1874, he was succeeded, without an election, by Dr. Thomas Frias, at that time president of the council. In about two years a new insurrection occurred. Dr. Frias was deposed by the troops May 4, 1876, and Gen. Daza, then commander of the army, proclaimed president by the soldiers. Gen. Daza formed an alliance with Peru, and late in 1878 joined that country in a war with Chili. The reasons offered for Gen. Daza's course were that the province of Atacama, which belonged to Bolivia, and the ports of Cobija, Mejillones, and Antofagasta, its only important seaports, lay between Chili and Peru, and this province must necessarily be traversed by the land troops of the former power before they could reach the latter. Antofagasta and the south part of Atacama had been already occupied by Chili, and the fear of the loss of Cobija, and of the remaining deposits of nitrate of soda on the desert lands, blinded the mind of Gen. Daza to the military superiority of the enemy. But Bolivia and Peru combined were in no condition to cope with the resolute and well-equipped armies of Chili; and when, after a year and a half of conflict, the Chilians held Cobija and farmed out the nitrate deposits of Atacama, leaving Bolivia without any access to the sea, and under the necessity of conducting her commerce through the territory of neighboring nations, who exacted transit-dues on it, the Bolivians, enraged at their losses, rose in insurrection, and on the 1st of June, 1880, deposed Daza and proclaimed Dr. Narciso Campero president. But this change did not satisfy the people. They wanted their captured territory returned, and as their new president could not perform impossibilities, and Peru had completely succumbed to the conquering Chilians, they deposed Campero early in 1882, and the country continued in a state of anarchy for many months. Late in 1882 a temporary dictator was appointed, and, Peru being helpless, Bolivia has made a separate peace with Chili, releasing all her coast-line except one small part, and giving up most of her nitrate of soda deposits in Atacama and Antofagasta. The territory thus rent from Bolivia has an area of 70,181 square miles and a population of perhaps 6000 inhabitants; this loss leaves the present area of the republic about 772,548 square miles, and with a present population estimated at 2,325,000, of which probably 575,000 may be Indians. As no census has been attempted for more than twenty years, these figures are to a large extent conjectural. The army equipped against Chili in 1879 consisted of about 6000 men of all arms.

See Vol. IV. p. 10 Am. ed. (p. 10 Edin. ed.).

Imports and Exports.—The exports of Bolivia in 1880 were about $850,000, the imports about $3,500,000. Most of the Bolivian commerce (especially since 1879) has been conducted through the ports of Mollendo and Arica, Peru. The exports are principally gold, silver, copper, and the ores of each, tin ores, salt, sulphur, nitrate of soda, guano, coffee, Peruvian bark, rice, barley, oats, maize, cotton, indigo, potatoes, choice fruits, and medicinal herbs and roots. The imports are mostly cotton goods, silks, iron, and hardware. There is a railroad line from the present capital, La Paz, to the port of Aygacha on Lake Titicaca. The line from Antofagasta to Salar is now Chilian. Other railways were in progress in 1878, but were abandoned when the war with Chili commenced. The capital has been changed more than once. For some years past it had been at Sucre or Chuquisaca, and sometimes at Oruro, but it has been removed to the old capital and chief city, La Paz, since 1878. The present population of La Paz is estimated at 27,000.

Education is at a low ebb, and there seems little prospect of a speedy improvement. The children of the wealthy classes are educated abroad. The very large Indian population is uneducated, and for the most part pagan, though a small number have become nominally Christians. An Indian land-tax affords a good part of the revenue of the republic. The rest is derived from import and export duties and the proceeds of mines and other state property. There are also direct municipal and departmental taxes.

Finances.—The financial condition of Bolivia is deplorable. The debt of the republic in 1881 was $31,700,000, of which more than $22,000,000 is an internal debt, much of it raised by forced war-loans. The foreign debt, about $8,500,000, was issued at sixty-eight cents on the dollar, and was raised in 1872 for the purpose of constructing a railway to enable the National Bolivian Navigation Company to open communication between the republic and the Atlantic Ocean. The railway was never built, and litigation has ensued. There is understood to be an annual deficit of from $1,300,000 to $2,000,000 on a total expenditure of less than $5,000,000. Yet the country is rich in resources, and if it could have a stable government, a good financial policy, and an efficient system of education, it might in a few years become prosperous. (L. P. B.)

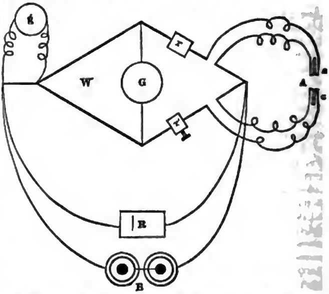
BOLOMETER (βολή, μέτρον), an instrument invented by Prof. S. P. Langley of Allegheny (Pa.) Observatory, for the measurement of very minute quantities of radiant energy. Its action depends upon the principle that the electrical resistance of a metallic conductor is increased by an elevation of temperature. The conductor to be acted upon is made one of the arms of a Wheatstone's bridge adjusted to perfect balance, and the disturbance of this balance produced by the warming effect of the radiant energy falling on the conductor measured by means of a galvanometer.

The conditions to be fulfilled by the conductor employed, as was seen from preliminary experiments and obvious theoretical reasons, are—great thinness and considerable electrical resistance, great change of resistance by temperature, a tenacity sufficient to enable the thin metal to support its own weight, and freedom from oxidation. The metal which has been found to answer most satisfactorily these requirements is platinum. Steel fulfils all the conditions except the last, and makes a very sensitive instrument, but is liable to rust, a tendency which can be only partly overcome by the application of a thin coat of oil.

The platinum to be used in the bolometer, having been rolled into very thin sheets, is cut into strips of one millimetre width. A parallel series of these strips is arranged across the central aperture of a circular disc of hard rubber, so as to occupy a space of about one half square centimetre, and so connected that the current must pass through the entire length. On both sides of the central aperture, but protected by the vulcanite, are disposed similar strips whose united resistance is equal to that of the central series, and through which flows the current from the opposite arm of the Wheatstone's bridge. The two currents being equal, the needle of the bridge galvanometer remains motionless, and any change of the temperature of the apparatus, by equally affecting the two series of strips, does not alter the equilibrium of the bridge. But when radiant heat is allowed to fall upon the instrument, the resistance of the central strips is increased by the warming, the strength of the current flowing through them is consequently diminished, and, the other current remaining unaltered, the needle of the galvanometer is deflected by an amount which depends upon the battery current and the intensity of the radiant energy. Since the deflections are in all cases very small, they may be regarded as proportional to intensities of the radiations producing them.

The circular rubber disc containing the system of strips described above is enclosed in a chamber situated in the axis of a cylindrical tube of ebonite about thirty centimetres long and five centimetres diameter, jointed in the middle to allow access to the instrument. The four terminals of the bolometer strips connect by means of screws which hold the disc in place, with four binding posts at the back end of the case. The front part of the case contains another tube holding a series of cardboard diaphragms with central apertures, which effectually prevent the entrance of air-currents from without, while a lining of copper with which the central chamber is provided secures an equable distribution of heat. The whole forms a neat and convenient instrument capable of being accurately pointed in any given direction, or held in a horizontal position by Y's. The position of the bolometer can be determined at any time by means of an eye-piece with cross-wires, held in a tube of precisely the same diameter as the case, and the place where a measurement is to be made optically examined.

The actual working arrangement of the apparatus is diagramatically represented in the annexed figure:



B is the battery, consisting usually of two gravity cells, W the Wheatstone's bridge, G a very delicate reflecting galvanometer, and A the bolometer, which in practice is connected with the electrical apparatus at a distance by four insulated wires bound together in the form of a cable and covered with flannel; *g* is a shunted galvanometer, by which the amount of current flowing through the bridge can be ascertained and regulated with the help of the variable resistance R; *c* represents the centre and *s* the side strips of the bolometer connected with opposite arms of the bridge. On opposite arms of the bridge are also a variable resistance *r* and a rheostat *r'* having a range of about ·05 ohms, in order to correct any small outstanding difference in the resistances of the two systems of strips and preserve the equilibrium of the bridge during the change which this difference undergoes when the temperature of the whole bolometer is altered. Such a gradual change of temperature produces a "drift" in the galvanometer needle which in a short time would throw the light from the galvanometer mirror beyond the limits of the scale if not corrected by the rheostat. Sudden changes of temperature in any part of the apparatus are guarded against as much as possible by protecting coats of flannel.

For some classes of measurements, and particularly in the spectrum, a very narrow or "linear" instrument is desirable; and a bolometer has been constructed having a single central strip of platinum whose width is but 0·2 millimetres. Measuring with this instrument in a prismatic spectrum so pure that the Fraunhofer lines were sharply defined upon a screen held at the distance of the bolometer, Prof. Langley was able not only to note the deficiency of energy at the dark lines of the visible spectrum, but to detect the existence of many bands in the infra-red region and determine accurately their positions; and so far its principal use has been to thus map the invisible part of the solar spectrum. It indicates with certainty the $\frac{1}{10000}$ of a degree Centigrade, and the heat from the moon may be recognized in the focus of an ordinary refracting telescope. The bolometer has also been found sufficiently delicate to give trustworthy measurements of the distribution of heat in the diffraction spectrum, and its value is demonstrated in many other ways.

A very valuable feature of the working action of the bolometer, and one which gives it a great advantage over the thermopile, is the promptness with which the maximum effect is reached. The conduction from front to back of the thin strips is practically instantaneous, and the equilibrium between the absorbed and radiated heat is so soon established that the effect upon the galvanometer is not sensibly increased by prolonging the exposure after the needle has reached the end of its swing. The time required for a single measurement will therefore depend in general upon the sensitiveness of the galvanometer employed. From comparisons by Prof. Langley, the bolometer was found greatly to exceed in efficiency, area for area, his most sensitive thermopile. (J. E. K.)

BONAPARTE, Elizabeth Patterson (1785–1879), an American lady noted for her romantic history, was born at Baltimore, Md., Feb. 6, 1785. Her father, William Patterson, was a wealthy shipping-merchant, and her education was conducted by her mother. At an early age she was remarkable for her wit, beauty, and grace. In 1803, Jerome Bonaparte, a youth of nineteen, who had been serving in the French navy in the West Indies, arrived in the United States, and was invited to Baltimore by Commodore Barney. Here he was attracted by the beauty and vivacity of Miss Patterson, and soon made a proposal of marriage, which she accepted. Her father had opposed the match, and the French consul protested against it, but the contract was carefully drawn by A. J. Dallas, and the marriage ceremony was performed by the Roman Catholic bishop of Baltimore, Rev. Dr. John Carroll, on Dec. 24, 1803. Napoleon, enraged at what he called the *mésalliance* of his brother, prohibited the registration of the marriage in France and declared it null and void. He also issued an order "prohibiting all captains of French vessels from receiving on board the young person to whom the citizen Jerome had connected himself, who shall by no means come into France, and should she arrive she shall not be permitted to land." Jerome received this information in the summer of 1804, but delayed taking any step. In the mean time, Napoleon declared himself emperor and formed an imperial court, but excluded Jerome from the dynasty, and threatened him with imprisonment unless he consented to repudiate his wife. In the spring of 1805, Jerome and his wife embarked for Europe in one of Mr. Patterson's ships, and arrived at Lisbon, April 2. Leaving her on board the ship, Jerome went to meet his brother, hoping to induce him to recognize the marriage. Napoleon at first refused to see Jerome, but finally an interview took place at Alessandria, May 6. The emperor declared that he would never acknowledge the marriage, but if Miss Patterson should return to the United States and not assume the name of Bonaparte, he would allow her an annual pension of 60,000 francs. In the mean time, she had sailed for Amsterdam, but finding herself excluded from all continental ports, she went to England. On July 7, 1805, her only child was born in a lodging-house at Camberwell, near London, and named Jerome Napoleon Bonaparte. In less than three months, convinced that her husband was about to yield to the threats of Napoleon and consent to a divorce, she returned to her father's house in Baltimore. The emperor in vain endeavored to persuade Pope Pius VII. to annul the marriage, but the French Council of State was more yielding and declared the marriage null and void. Jerome was married to the princess Catharine of Würtemberg, Aug. 12, 1807, and was then made king of Westphalia by his brother. Madame Bonaparte afterwards, yielding to the inevitable, accepted a pension from Napoleon on the terms before mentioned. She also obtained a divorce by an act of the Maryland legislature; in Europe she was henceforth known as Mrs. Patterson, but in America she was called Madame Bonaparte. Two months after the final overthrow of Napoleon at Waterloo she again visited Europe, and spent the autumn of 1815 in England and the winter in Paris. Louis XVIII. invited her to court, the duke of Wellington admired her beauty, Talleyrand extolled her wit, and the most distinguished men and women of the time were among her acquaintances. Returning to Baltimore in the summer of 1816, she resided there for three years, when she went to Europe, accompanied by her son, whom she placed at school in Geneva. She visited the princess Borghese (Pauline Bonaparte) at Rome in November, 1821, and was kindly received. While residing at Florence in the spring of 1822 she saw her husband for the only time after their separation. Jerome was startled, and whispering to the princess Catharine, who was leaning on his arm, "That is my American wife," immediately left the gallery, and the next day quitted Florence. Madame Bonaparte at this time, though treated with the highest distinction, suffered much from melancholy; she was oppressed with want of wealth. In her declining years, after a lifetime of saving, she said, "Once I had everything but money; now I have nothing but money." She spent altogether fifteen years in Europe; she regarded a residence in America as an exile and complained of the dulness of Baltimore. She made several unsuccessful attempts to have her rights recognized by the French courts, which were always resisted by King Jerome and Prince Napoleon. Her last effort was in 1860, after the death of the former, when the eloquent Berryer pleaded her cause. She then returned to Baltimore, where she died April 4, 1879. She left a fortune of $1,500,000 to her grandsons, Jerome Napoleon and Charles Joseph Bonaparte. To the latter she also left numerous manuscript volumes containing her diaries in Europe, etc.

Her son, **Jerome Napoleon** (1805–1870), was educated at Mt. St. Mary's College, Emmittsburg, Md., at Geneva, and at Harvard, where he graduated in 1826. On visiting Europe he was cordially received by his father and other members of the Bonaparte family. Though educated for the law, he did not practise, but devoted his time to agriculture at his country-seat near Baltimore. He died June 7, 1870.

His eldest son, **Jerome Napoleon**, was born in Baltimore Nov. 5, 1830. He graduated at West Point in 1852, and served two years in the U. S. army. He was then appointed by Napoleon III. a lieutenant in the French army, and served with honor in the Crimea and in Italy. He was also engaged in the Franco-Prussian War, and after the surrender at Sedan escorted the empress Eugénie to England. He hastened back to the defence of Paris, but at the close of the war returned to America. He resides at Newport in the summer and at Washington in the winter. (E. L. D.)

BONAR, Horatius, D. D., a distinguished minister of the Free Church of Scotland, hymn-writer, and author, was born at Edinburgh, Dec. 19, 1808. He is descended from Rev. John Bonar of Torphichen, one of the twelve evangelical ministers involved in the famous Marrow Controversy. His father, James Bonar, was a solicitor and a man of some learning, as is shown by his philological treatises. Horatius was educated at the high school and the university of his native city, and studied at the Divinity Hall there while Dr. Thomas Chalmers was in the height of his vigor and Christian zeal. Being licensed to preach, Mr. Bonar became a missionary assistant in South Leith, but soon was called to be pastor of the North Church, Kelso, where he was ordained Nov. 30, 1838. Here he first displayed his power as a preacher, his faithfulness as a pastor, and his ability as a writer. He was editor of the *Presbyterian Review*, and during a religious revival issued the *Kelso Tracts*. In 1843, together with his congregation, he followed his great leader, Dr. Chalmers, in separating from the Established Church and forming the Free Church of Scotland. In 1846 he published *Truth and Error*, and in 1853 he founded the *Quarterly Journal of Prophecy*, of which he is still editor. In the same year the University of Aberdeen conferred upon him the degree of D. D. In 1856, Dr. Bonar visited the Holy Land, and after his return published two volumes, one on *The Desert of Sinai*, the other on *The Land of Promise*. In 1859 he became editor of *The Christian Treasury*, a family magazine. In 1866 he was called to the Grange Free Church, which had just been erected in Edinburgh as a memorial of his friend and teacher, Dr. Chalmers. His devotion to pastoral and literary labors has prevented him from taking a conspicuous part in public affairs, yet few ministers have exerted a wider or more beneficial influence. His hymns have been received with favor by Protestant Christians in all parts of the world. They have been collected from time to time, and now comprise three volumes under the title *Hymns of Faith and Hope*, and another called *Lyra Consolationis*. Among his books are *The Night of Weeping*, *The Morning of Joy*, and *The Eternal Day*. His peculiar views of the interpretation of the prophecies of Scripture are set forth not only in his *Review*, but also in his *Prophetic Landmarks*. His daughter was engaged with her husband, Rev. G. Theophilus Dodds, in the McAll Mission in Paris, and Dr. Bonar's intimate acquaintance with this work was shown in his account of it in his *White Fields of France*. He has also published a long meditative poem under the title *My Old Letters*.

BOND, an obligation, in writing and under seal, to pay a sum of money. The usual form of bond is with a *condition*, the liability of the obligor to pay the money arising only in failure in the performance of the condition. A bond is sometimes for the payment of money only, commonly called a "money bond," in which case it is usual to make the obligation for a *penal sum* double the amount of the actual debt, the condition being for the payment of the real debt at the time specified. In early times the whole penal sum could be recovered upon failure to pay the amount named in the condition, but at the present day courts of equity have established the principle that such a failure to pay operates as a forfeiture, and limits the recovery to the real debt and interest. Bonds are also sometimes made for the performance of a certain act, in which case, upon the same principle, a recovery is limited to the damages sustained by the obligee by reason of the obligor's failure to perform the act. A *joint* bond is one executed by two or more persons, and it is *joint and several* where the obligors bind themselves both collectively and separately. (S. W.)

BONHEUR, Rosalie or Rosa, a French artist celebrated for her landscapes and paintings of animals. She was born at Bordeaux, March 22, 1822. Her father, Raymond Bonheur, who died in 1853, was an artist of ability, and from him she received instructions in the technicalities of painting. On the removal of the family to Paris, Mademoiselle Bonheur, in order to prosecute her studies of animal life with as little inconvenience as possible, adopted a masculine dress. She frequented the abattoirs, sketched in the streets, and otherwise availed herself of whatever opportunities for study presented themselves. As was almost inevitable under the circumstances, she speedily gained a reputation for eccentricity, and there is no doubt that her costume and method of study had much to do with the celebrity which her early works achieved. There is no reason to believe, however, that the artist affected singularity, or that in pursuing the course she did she was animated by a desire other than to make herself a thoroughly accomplished painter. The popular applause which was accorded to her pictures was supplemented by the discriminating praise of good judges who were not likely to be influenced, except perhaps adversely, by the considerations to which the crowds which gathered about her canvases in the exhibition-rooms seemed to attach particular importance. Mademoiselle Bonheur's first contributions to a public exhibition were made in 1841. Her pictures of this year—one representing a couple of rabbits, and the other some sheep and goats—were small, but they were recognized as intelligent and truthful transcripts of nature and as making great promise of future excellence. These pictures were followed in rapid succession by a number of compositions representative of animal life, which speedily gained for Mademoiselle Bonheur the credit of being one of the best delineators of animal life in France. In 1849 she exhibited Labourage Nivernais, a composition which excited a great deal of enthusiasm—on account of the excellence of the landscape no less than because of the spirited manner in which the human and brute figures were represented. This admirable picture was purchased by the Government and added to the Luxembourg collection. By many good judges it is esteemed to be Mademoiselle Bonheur's masterpiece; certainly she has never surpassed it as a refined and sympathetic interpretation of a phase of nature or as a forcible representation of figures in action. Up to this time Mademoiselle Bonheur was little known outside of France, except by reputation, and her reputation both in England and in America was largely dependent on the stories told about her masculine dress and her disregard for conventionalities. In 1855, however, her large picture entitled The Horse Fair was exhibited in London and other English cities, and afterwards was brought to the United States. The great merit of this composition met with ample recognition both in England and in America. To the Universal Exhibition of 1865 in Paris she contributed a large landscape entitled The Haymaking Season in Auvergne.

The bulk of Mademoiselle Bonheur's pictures are of moderate dimensions, and there are few private collections of any importance either in England or the United States which do not contain one or more of them. Mademoiselle Bonheur has received several medals, and in 1865 she was decorated with the cross of the Legion of Honor. In 1868 she was appointed a member of the Institute of Antwerp. Since 1849 this artist has had the direction of a school of design for young girls at Paris. During the Franco-Prussian war, when the Germans were besieging Paris, the studio and residence of Mademoiselle Bonheur at Fontainebleau were spared from molestation by order of the crown prince of Prussia. The prominent characteristic of Mademoiselle Bonheur's style is force rather than refinement. Her handling is bold and vigorous, and she is particularly successful in the representation of strong action. Her later works have lacked many of the qualities which won for her earlier ones commendation, and good judges have accorded her brother Auguste—now dead—the credit of being the better painter, although he never rivalled his sister as a delineator of action, and never succeeded in gaining the same repute with the general public. (W. J. C., JR.)

BONNAT, Léon-Joseph-Florentin, a French artist, was born at Bayonne in June, 1833. He first studied at Madrid under Frederic Madrazo, and afterwards at Paris under Léon Cogniet. He took the second *prix de Rome* in 1857, but as this did not permit him to visit Italy at the expense of the Government, his friends in his native place subscribed a sum which enabled him to make a sojourn in Italy. In 1860 he exhibited Adam and Eve finding the Body of Abel, which gave him a prominent place in the public estimation. This picture was purchased for the museum of Lille. This was followed by a number of pictures of Italian subjects, which added to the artist's reputation. Among his important compositions are Antigone leading the Blind Œdipus, St. Vincent de Paul taking the Place of a Prisoner (a commission from the city of Paris), The Assumption, Christ on the Cross (painted for the Palace of Justice in Paris), A Negro at Suez, The Wrestling of Jacob, A Turkish Barber, Scherzo, Sheiks of Akabah, A Woman of Ustaritz, A Fellah Woman and her Child, A Street in Jerusalem, Italian Dancers, and The First Step. Bonnat is even more celebrated for his portraits than he is for his composition pictures. His portrait of M. Thiers, which bears the date of 1877, is perhaps his most famous performance in this line. Bonnat appears to be absolutely destitute of imaginative qualities. No matter how complex his theme may be, or how great may be its ideal demands, he treats it in the simplest and most realistic fashion; and if the picture commands admiration, it does so through the strength of the workmanship rather than because of any high intellectual qualities. Bonnat is esteemed by many good judges to be the best painter in France. Certainly, his figures have a wonderful solidity and a wonderful reality. For a long time this artist has conducted a school which is more frequented, especially by American students, than any in Paris outside of the École des Beaux-Arts. His services are given gratuitously, and the school, like most of those supervised by the leading French artists, is managed by the students themselves, the expenses being divided *pro rata*. Bonnat has great gifts as a teacher, and he has zealous partisans in all who have enjoyed the privilege of his instruction. He has received several medals, and is an officer of the Legion of Honor. (W. J. C., JR.)

BOONE, a city of Boone co., Iowa, is on the Des Moines River, 42 miles N. of Des Moines, with which it is connected by the Wabash, St. Louis, and Pacific Railroad. It is also a division terminus of the Chicago and North-western Railroad. It has a city-hall, opera-house, three banks (one national), public library, three hotels, three weekly newspapers, nine churches, and four school-houses. It is the business-centre of a rich agricultural section, having also large beds of potters' and fire-clay and bituminous coal. It has two foundries, linseed-oil mill, woollen-mills, flour-mills, and other manufactures. It was founded in 1865, incorporated as a town in 1866 and as a city in 1868. Population, 3330, chiefly of American birth.

BOONE, Daniel (1735–1820), a famous Western pioneer, was born in Bucks co., Pa., Feb. 11, 1735. At the age of eighteen he removed with his father's family to North Carolina, where he married Rebecca Bryan and lived as a farmer. Having made several hunting-excursions into the wilderness, he set out in 1769, with five others, to explore Kentucky. In December he was captured by the Indians, but twice made his escape, and spent several weeks alone, depending on his rifle for support. He returned home in March, 1771, and two years later, accompanied by five families besides his own, started for Kentucky, but was obliged to stop for a time at the Clinch River. Boone, having assisted the State surveyors, was appointed captain in command of the garrisons to keep back the hostile Indians. He erected a fort at Boonesborough on the Kentucky River, where he settled with his family. In December, 1777, he set out on an expedition to the celebrated Blue Licks to prepare and bring back a supply of salt for the garrisons. On his return, a month later, having become separated from his men while hunting, he was surprised, and surrendered his party to the Indians. They were taken to Detroit, where most of them were delivered to the British commander; but Boone, being too highly esteemed, was retained and adopted into the family of Blackfish, a Shawanese chief. He escaped in June, bringing word of the plan of an attack by Indians under the British flag. This attack, made by 445 men, he successfully repulsed with only 50 men. He was afterwards tried by court-martial for his surrender, but acquitted and promoted to be major. During his captivity Boone's family had returned to North Carolina; in 1780 he brought them back to Boonesborough, and was made lieutenant-colonel of Lincoln county, one of the three divisions of Kentucky Territory. The Indians, excited by the increasing immigration of the whites and assisted by some renegades, attacked the settlements, and on Aug. 19, 1782, Boone fought a desperate battle with 400 Indians at Blue Licks, in which one of his sons was killed. He afterwards had great trouble in getting the title to his lands registered, and while on a visit to Virginia for this purpose was robbed of a large sum of money, much of which had been entrusted to him by his neighbors. Having thus lost his property, in 1790 he visited his birthplace, and then settled at Point Pleasant on the Kanawha River, now in West Virginia. In 1795 he proceeded to Missouri, where he lived on the Femme Osage River from 1795 to 1804. While this region belonged to Spain he was made commandant of the district, and received a large tract of land, which he also lost for want of a title after the United States acquired the territory in 1803. Congress in 1812 confirmed his title to another tract in consideration of his public services. He died at the home of his son-in-law, Flanders Callaway, at Charette, Mo., Sept. 26, 1820. Boone was five feet ten inches in height, robust and powerful; his countenance was mild and contemplative. His characteristics were shrewdness, caution, courage, and muscular strength. He was a safe guide and wise counsellor, but better fitted for single adventures than for commanding an expedition; yet he was undoubtedly the founder of Kentucky. An original portrait of him, painted by Chester Harding in 1820, hangs in the State-house of Kentucky. In 1845 his remains were brought to Frankfort, Ky., and placed in the cemetery there with appropriate ceremonies. In 1784, John Filson wrote an account of Boone's adventures as related by himself, which was reprinted in Finlay's *Description of the Western Territory* (1793). Popular lives of Boone have been written by W. H. Bogart (N. Y., 1854), T. Flint (Cinn., 1854), S. C. Hill (Phila., 1859), J. S. C. Abbott (N. Y., 1872). See also Collins's *History of Kentucky*, vol. ii.

BOONTON, an incorporated town of Morris co., N. J., is on the Morris Canal and on the Boonton branch of the Delaware, Lackawanna, and Western Railroad, 32 miles W. of New York. It has three hotels, a weekly newspaper, five churches, and a high school and other schools. It has a very extensive iron-works, large silk-mill, paper-mill, knife-factory, and India-rubber mill. Population, 2277.

BOONVILLE, the county-seat of Cooper co., Mo., is on the S. bank of the Missouri River, 225 miles by water from St. Louis and 35 miles N. E. of Sedalia. It is the terminus of a branch of the Missouri Pacific Railroad, and is on the Missouri, Kansas, and Texas Railroad, which crosses the river here. It has seven hotels, two banks (one national), four weekly newspapers, seven churches, two colleges, three private schools, besides public schools. The industries comprise three flour-mills, a woollen-mill, three potteries, a shoe-factory, chair-factory, and a foundry. It is well situated on a bluff 100 feet above the river, is lighted with gas, and has water-works. Lead, coal, iron, and limestone are found in the vicinity. At the commencement of the Civil War the Confederate sympathizers established a camp at Boonville, but on June 17, 1861, Gen. Lyon routed the troops and captured the camp. In a second fight, Sept. 13, 1861, the State militia defeated a Confederate force, the latter losing the colonel in command. In 1880, Boonville had a population of 3854.

BOONVILLE, a village in Oneida co., N. Y., is on the Black River Canal and on the Utica and Black River Railroad, 34 miles N. of Utica. It has three hotels, two banks, an opera-house, six churches, a union school, a weekly newspaper, wagon-factory, two flour-mills, two sash-and-blind factories, chair-factory, tannery, foundry, canal-boatyard, two saw-mills, and marble-works. It was settled in 1795 by emigrants from New England. Population, 1677.

BOOTH, Edwin Thomas, an American actor, was born near Baltimore, Md., Nov. 15, 1833. He is a son of the famous actor Junius Brutus Booth, and was early trained for the stage. He made his first appearance at the Boston Museum, Sept. 10, 1849, as Tressel in *Richard III.* After the death of his father, in 1852, he went to California, and in 1854 he visited Australia. On his return to New York in 1857 he appeared as Richard, and was eminent for his personation of Shakespearian characters, especially Iago and Hamlet. He went to Europe in 1861, playing in England and studying on the Continent. On his return to New York in 1864 he commenced a series of Shakespearian revivals at the Winter Garden Theatre, in which he acted the part of Hamlet for 100 consecutive nights. After the destruction of this theatre by fire he erected in 1869 a splendid building which he devoted to the classic drama. In 1873 he retired from its management, and has since confined himself to acting. In 1882 he visited Europe professionally, and was enthusiastically received, especially in Germany. He is tall and well-formed, with pale, classic countenance, deep-black eyes and hair. As an actor he is refined, graceful, and intellectual, with wonderful intensity of expression.

BORDENTOWN, a city of Burlington co., N. J., is on the Delaware River, 30 miles N. E. of Philadelphia, and on the Camden and Amboy branch of the Pennsylvania Railroad. It is the terminus of the Delaware and Raritan Canal. It has a bank, four hotels, an opera-house, two public halls, two weekly newspapers, nine churches, the Bordentown Female College, a military institute, and public schools. It has a park, gas- and water-works, a ship-yard, several foundries and machine-shops, and a shirt-factory. The town was founded in 1717 by Joseph Borden. It has been the residence of Francis Hopkinson, of his son Judge Joseph Hopkinson, and of Admiral Charles Stewart. Joseph Bonaparte, ex-king of Spain and Naples, resided here in a stately house surrounded by a beautiful park; here also resided his nephew, Prince Murat, son of Joachim Murat, king of the Sicilies. A history of the city has been published by Maj. E. M. Woodward. Population, 4258.

BORODINO, a village in the government of Moscow, Russia, 75 miles W. S. W. of Moscow, situated on the Kologa, a small affluent of the river Moskwa, near which was fought a great battle resulting in a dearly-purchased victory for the French against the Russians on the 7th of Sept., 1812. The former were commanded by the emperor Napoleon in person, and the latter by Gen. Kutusof, aided by Barclay de Tolly, Bagration, and Benningsen. The French called it the "battle of the Moskwa." The Russians, under the command of Barclay de Tolly, had from the beginning of Napoleon's invasion lured the French army on, fighting fierce battles and retreating to avoid the counter-strokes. As they approached the old capital, Moscow, Napoleon thought he could bring them to a stand in its defence. For himself, the only course was to go forward, seize Moscow, and dictate terms of peace there. He was within eight days' march of the city; so, making rapid arrangements to secure his rear, he followed the Russian army with all the vigor of which his army was capable. His cavalry was in a very bad condition. It had very hard work acting as scouts, protecting the flanks, and feeling the enemy in front, holding on till the infantry came up, when the enemy would decamp. To do this work the horses had no food but coarse rye straw, and no time for rest and recruiting. Every hour now disclosed the ethnic and national complexion of the Russian resistance. Towns along the line of retreat were set on fire and deserted by their entire populations. Numerous armed bands hovered in front and rear, on the right and left, cutting off the French stragglers and foragers. Cities like Wiasma and Gjatsk were burned to the ground, giving the enemy a prophetic foretaste of the conflagration of Moscow. The French army was an immense movable column in the heart of the hostile country, surrounded by an exasperated nation.

Barclay de Tolly had stationed his army in a very strong position at Gjatsk, where it would have been far better able to oppose the desperate French advance upon Moscow; but his Fabian policy, which was later to be vindicated, had not been acceptable to the emperor Alexander. Besides, he was of Prussian birth, and his numerous retreats caused unfounded misgivings. Clamors were raised for a commander of pure Russian blood who would fight the French to the utmost. To answer this demand Barclay was superseded in August in the supreme command by Gen. Kutusof, the distinguished "conqueror of the Turks." The new general assumed the staff on the 29th of August, and Barclay was reduced to the command of the right wing. To take a new departure, and with some invidious feeling towards his predecessor, Kutusof abandoned the strong position of Gjatsk, and fell back to Borodino in front of Mojaisk. To defend the capital it was evident that he must fight a desperate battle. On reaching Borodino he received a reinforcement of 10,000 men, newly-organized militia from Moscow. By the 5th of September the Russians were posted and entrenched. Their most advanced work was a redoubt far in front of their left, near the village of Schwardino. This, not being properly protected by the works in rear, was assaulted and gallantly carried by Campans' division on the 5th. The Russians had about 130,000 in the field, besides 40,000 in or near Moscow. They had 600 guns. Three *flèches*, or elevated redans, covered their left in front of Semenofskoe. A large and dominant bastioned redoubt had been erected on a height between Semenofskoe and Borodino. Their right, entrenched by the river in the angle of junction, was further protected by several redans towards the Moskwa. The general arrangement of the troops was as follows: Barclay de Tolly, with three corps of infantry and one of cavalry, commanded their right from the bastioned redoubt to the Moskwa. His force was divided into two distinct parts by the ravine of Gorki. Bagration, with the Seventh and Eighth corps, commanded the left wing from the bastioned redoubt to the coppice-wood between Semenofskoe and Oustrea. The troops of Benningsen were in the centre, but he was acting as chief of staff and had posted all the corps. This disposition is declared by critics to be faulty, because the best troops and the greatest number were on the right. which was strong by nature; the left was too weak. The plan of Napoleon was to turn the left flank of the enemy, and thus uncover the old road to Moscow; and he found that the space between the redans and this road was really observed rather than guarded by some chasseurs, presenting a very vulnerable point. The French army, about 125,000 strong, was inferior to the enemy in men and guns, and was now obliged to attack entrenchments. The 6th of September was spent by both armies in careful reconnoissances, in strengthening the lines, and, on the part of the Russians, in religious ceremonies. During the night of the 6th the Russian left was reinforced, but this did not alter the general features of Napoleon's order.

At six o'clock on the morning of the 7th the signal was given. The artillery opened upon the elevated redans. Poniatowski, with his Poles, moved upon the extreme left of the enemy. Campans attacked the redan on the extreme right of the Russian line, aided by Denar, with Friant in reserve. Davoust attacked the the centre. Many generals were killed; Ney advanced in gallant style and restored the threatened order. Kutusof strengthened the threatened points. The fighting was desperate. Bagration attacked Ney as he advanced, and was desperately wounded, as was also his lieutenant, St. Priest. The retreating Russians were rallied by Konownitzin. Large reinforcements were sent up by the French, and thus the battle swayed backward and forward. Prince Eugène Beauharnais obliqued Meraud's division to the right; its commander was stricken down and his troops were forced back. Never before had the French encountered such murderous resistance. Finally, the desperate efforts of Ney and Davoust were crowned with success, and the French advanced, closing up along their whole line. Again the artillery was brought into action; within the space of half a league eight hundred guns were dealing death and destruction. "Never," says Jomini, "was there a spectacle at the same time so imposing and so terrible. All the actors in this grand drama proclaim it, with one accord, *the battle of the giants.*"

The great redoubt must be carried: Montbrun, who led the attack, was killed by a cannon-ball. Napoleon sent Count Augustus Caulaincourt, brother to the duke of Vicenza, to take his place; he fell by a musket-shot, but the redoubt was taken. It was now three o'clock in the afternoon. The French were masters of the redoubt and the redans on the left. The Russians were congregated behind the ravines of Goristskoe and Semenofskoe. The battle had drifted into a cannonade, and so night came down upon the field. Before daylight the army of Kutusof was retreating by Mojaisk and the old road to Moscow. The retreat was conducted in perfect order, followed rather than pursued by the French advance, which came near getting into another battle near Mojaisk.

The losses on both sides reached the enormous number of 80,000. From 12,000 to 15,000 wounded Russians were conveyed to Moscow, where many of them perished in the burning of the city. The French wounded suffered greatly; many died from want of care. Many generals were killed and wounded on both sides; among the former was Bagration. Kutusof, who was not wounded, died within the year. The Russians had inflicted such damage upon the French, and retreated in such good order, that they claimed a victory. In 1839 they erected a mausoleum upon the battlefield. The French more properly called it a victory; they held the field, and in seven days after they were in Moscow. Marshal Ney, the French Achilles, was made prince of Moskwa for his splendid valor in this action. (H. C.)

BOROUGH. This term, although frequently used in the United States as the equivalent of "town," has received legal recognition only in Connecticut, New Jersey, Minnesota, and Pennsylvania. It there signifies an incorporated town or village, and has lost its distinctive meaning as the constituency of a member of Parliament or other legislative assembly.

See Vol. IV. p. 55 Am. ed. (p. 62 Edin. ed.).

In Pennsylvania the power "to erect and incorporate towns into boroughs" was granted to William Penn by the charter of March 4, 1682. At present a general statute regulates the incorporation of boroughs, by which, upon application by the inhabitants of a town or village, the court of quarter sessions having jurisdiction is empowered, after approval by the grand jury, to constitute the community a body corporate having the usual powers and privileges of municipal corporations. The voters of the borough elect a burgess and five or more members of a borough council, together with overseers of the poor, auditor, and constable. These officers appoint a treasurer and clerk. A penalty is imposed for refusal to serve as borough officer when elected.

In Connecticut several of the larger towns were at an early day created boroughs by charter. The chief burgess is termed the warden, and with his council of burgesses, treasurer, clerk, and bailiff is elected at the annual borough meeting. In Pennsylvania and Minnesota all boroughs are independent of the townships; but in New York and Connecticut they form parts of the townships in which they are situated. (J. R. P.)

BORROW, George (1803–1881), an English author, traveller, and translator, was born at East Dereham, Norfolk, in Feb., 1803. His father was a military officer, whose frequent changes of location interfered with the education of his son. The latter, however, attended the high school of Edinburgh for two years, and at the age of fifteen was articled to a solicitor in Norwich. Here he became a frequent visitor to the Gypsies of the neighborhood, and developed a remarkable faculty for the acquisition of languages. Before he was eighteen he understood twelve languages. On his father's death he abandoned the law and went to London, to make his living by authorship. He had already published anonymously a crude book on *Faustus* and a translation of some Danish ballads. His health failing in London, he entered on a wandering life, being at times a tinker, postilion, gypsy, etc. In 1833 he was employed by the British and Foreign Bible Society, and traversed parts of the Continent, mostly on foot. While in Russia he edited the New Testament in the Manchoo language, and published a book called *Targum*, containing metrical translations from thirty languages. While in Spain he was twice imprisoned for endeavoring to circulate the Bible. He also edited a Spanish translation of the New Testament and translated the Gospel of St. Luke into the Gypsy language. He returned to England in 1839, and in 1841 published *The Zinkali*, an account of the Spanish Gypsies, with a collection of their songs and a vocabulary showing the affinity of their language to the Sanskrit. This was followed in 1843 by *The Bible in Spain*, in which he gave graphic descriptions of the people of that country and an interesting account of his personal adventures. Borrow then returned to the Continent and visited the Gypsies of Hungary and Wallachia. His next work, *Lavengro, the Scholar, the Gypsy, and the Priest* (1851), is a sort of autobiography, giving many particulars of his wandering life. A sequel, *Rommany Rye*, was published in 1858. He also contributed prose and verse to various periodicals, and made translations from other languages, especially the Welsh. He published *Wild Wales* (1862), and *Romano Lavo-Lil* (1874), a vocabulary of the dialect of the English Gypsies. He died July 30, 1881.

BOSNIA. In 1875 this province, which then constituted one of the *vilayets* of European Turkey, was the scene of a formidable insurrection, which became, indirectly, one of the principal causes of the war of 1877–78 between Russia and Turkey, and led to the dismemberment of the Turkish empire. This insurrection, in which the Christian peasants and small proprietors, after suffering every possible oppression and outrage, at last avenged their injuries and wrongs, had three principal causes: 1st. The tyranny of the bishops, Fanariot Greeks, who were tools of the Porte, their sole object being to obtain the largest possible amount of money, which was divided with their Moslem masters; 2d. The oppression of the Moslem landlords, who seized with greedy hands upon their crops as rent; 3d. The cruel exactions of the tax-gatherers. These last had been more oppressive than usual in this year of 1874–75, because the Government had demanded of them more money than ever before. These Christian peasants and small proprietors, though comprising two-thirds of the population, were unarmed and accustomed to submission, and only revolted when the oppression became intolerable. The ruling classes, bishops, landlords, and tithe-farmers, alike despised them, and, as the Turkish officials had no regular troops at command to put down the insurrection, they accepted the services

See Vol. IV. p. 60 Am. ed. (p. 68 Edin. ed.).

of an irregular bandit soldiery, the terrible *bashi-bazouks*. The Christians, rendered thoroughly desperate by the outrages of these wretches, appealed for help to the Montenegrins and the Servians on the plea of a common nationality and a common faith. The Montenegrins at once sent to their aid arms, leaders, and a strong force of mountaineers, and the Servians soon followed. Thus encouraged, the peasants of Bosnia and the Herzegovina gathered, before the end of 1875, a well-armed and well-organized force of 12,000 men, and hunted down the bashi-bazouks and those who had employed them. These fled into Bulgaria, where, in 1876, another insurrection occurred from different causes. while the Bosniac peasants had now a season of relief. The population of Bosnia at this time was a little more than 1,200,000, the insurrection having considerably diminished its numbers. Of these, nearly 800,000 were Christians, mostly of the Greek Church, though there were many Roman Catholics; and about 440,000 were Mohammedans, but nearly all Bosniacs and of Slavic race. These Moslems were for the most part the landlords and proprietors.

The Servian war with Turkey, which commenced in July, 1876, had been prompted by Russian emissaries, and was ill-advised and unsuccessful. The Bosniacs took little part in this war, but busied themselves in driving out their oppressors from their territory and in demanding justice for the future from the Turkish governor, Dervish Pasha. A commission sent by the great powers of Europe to investigate their condition found that the grievances were many and serious and the demands of the peasants moderate and just. As formulated by the Herzegovinian leaders, the demands were: (1) That Christian girls and women should no longer be molested by the Turks; (2) that their churches should not be desecrated, and that free exercise of their religion should be accorded them; (3) that they should have equal rights with the Turks before the law; (4) that they should be protected from the violence of the Turkish police; (5) that the tithe-farmers should take no more than their just dues, and should take these at the proper time of the year; (6) that every house should pay in all only one ducat a year; (7) that no forced labor, either personal or by horses, should be demanded by the Government, but that labor, when needed, should be paid for. The commission of the powers demanded the guarantee of the Ottoman Porte for the safety of these Christians, but the sultan refused his assent, and the commission was declared a failure. These and other demands were presented again by the Russian envoy to the Turkish Government, but were refused, and after further efforts by the conference of the great powers to maintain peace had proved unavailing, war with Turkey was declared by the czar on the 12th of April (o. s.), 1877.

By the Treaty of Berlin, signed July 13, 1878, it was decided that "the provinces of Bosnia and Herzegovina should be occupied and administered by Austria-Hungary." The expression was capable of different interpretations, but that which the Austrian Government put upon it warranted it in incorporating it as practically a new province in the empire, and the Austro-Hungarians proceeded at once to do so; but they could not effect their purpose except at a considerable cost in blood and treasure. The Bosniacs have not been altogether pleased at being thus delivered over to new masters without their own consent. There have been, since the first sharp anti-Austrian struggle, some further disturbances, but none of any great importance.

A census was taken by the Austrian Government in June, 1879, from which we gather the following facts: Area of Bosnia, Herzegovina, and Novi-Bazar, 24,247 square miles; population, June, 1879, 1,212,172, of whom 448,613 were Mohammedans, 496,761 Greek Orthodox, 209,391 Roman Catholics, 3426 Jews, and the rest (53,981) mostly Protestants. Under Austro-Hungarian military rule Bosnia has no separate record of commerce, imports, exports, or taxes.

History.—The insurrection of 1875–76, the explorations of travellers, and the subsequent war between Russia and Turkey have thrown much light upon the history of Bosnia, which had previously been an almost unknown region. The people who now inhabit it are Slavs, mainly of Serb and Croat affinities, who descended from the regions north of the Danube upon this country, by invitation of the Roman emperor of the East, in the fifth century of our era, driving back the Avars, Huns, and other tribes which had previously occupied it. The Bosniacs are believed to be of purer Slavic blood than any other of the inhabitants of the Danubian kingdoms or principalities, and they retained for many centuries the simple forms of the political institutions which have characterized the Slavic race. They possessed the commune with its elders, the congregations of communes known as *zupas*, and the combination of these into grand zupas, each ruled over by zupans and grand zupans, the latter title being corrupted into *ban* in Bosnia. These bans, and the duchies or banates over which they ruled, acknowledged the suzerainty of the Eastern empire to a limited extent, but in the ninth century were compelled to yield to the sway of the Bulgarian czar. In the tenth century they had thrown off the Bulgarian yoke and become independent princes, some of them, however, recognizing Tomislav, king of the Croats, as their sovereign. About the middle of the twelfth century Boric, a natural son of Coloman, king of Hungary, became ban of Bosnia, and was succeeded by his son, "the good ban Culin," in 1168, who reigned with undisputed sway for thirty-six years. During his reign Bosnia enjoyed great prosperity, and its resources were developed. Zibisclav succeeded in 1205, and on his death in 1241 other and weaker men, fully under the control of the king of Hungary, ruled till 1275, when the king of Serbia, Stephen Dragutin, became the overlord or chief ruler of Bosnia. The influence of Hungary now declined, and in 1358, when Stephen Tvart-ko, a nephew of Louis the Great of Hungary, succeeded to the banate of Bosnia, he added several of the smaller banates (Herzegovina, Dalmatia, etc.) to his dominion, and compelled his uncle to allow him to assume the title of king of Bosnia. He was slain in the battle of Kossevo in 1389, and left a diminished kingdom to his successors, Tvart-ko II. and Tvart-ko III., whose reigns, however, extending to 1443, were prosperous. The Turks had, during these reigns, gained a foothold in the Herzegovina, and took advantage of every opportunity of acquiring new territory. With the death of Tvart-ko III., in 1443, the power of the Bosniac kingdom began to wane. His successor, Stephen Thomas, was weak and vacillating; he betrayed his faithful subjects, and brought upon himself the contempt and distrust even of those who had forced him to become a traitor. The Turks were constantly making raids into Bosnia, and though he appealed to the pope and the king of Hungary for help against the infidels, his appeals were unavailing. In 1459 he was assassinated by his step-brother, Radivoj, and his own illegitimate son. Stephen Tomasevic. The latter at once usurped the throne, but proved a greater coward and poltroon than his father; instead of fighting the Turks, he turned his arms against his dissident subjects and drove 40,000 of them from the realm, hoping thus to obtain the pope's support; but the king was treacherously slain by the Turks, the Bosnian nobles were exiled, or transported to Asia; 30,000 of the picked youth of Bosnia, sons of nobles and landed proprietors, were taken to recruit the Janissaries and to be brought up in the Mohammedan faith, and 200,000 of the inhabitants were sold as slaves. Twenty years later (in 1483) a similar fate befell the Herzegovina, which was at that time an independent principality. When the young men, after their service with the Janissaries, returned to Bosnia, they were Mohammedans, and as such regained possession of their ancestral estates. These Bosniacs—thus summarily converted to Mohammedanism—and their descendants have been almost the only Slavic Mohammedans in the Turkish empire. From the earliest years of the tenth century there had been in Bosnia a large body of dissident Christian believers (Bogomils), opposed alike to the Orthodox Greek Church and to the Roman Catholic Church. Their long and interesting history has been but imperfectly preserved. For many years they endured the severest persecutions. A few of their descendants are still to be found in Bosnia, but in the fifteenth and sixteenth centuries the greater part of the Bogomil Christians were expatriated. The Russian dissidents are largely descended from this Bosnian stock.

See Vol. IV. p. 64 Am. ed. (p. 72 Edin. ed.).

BOSTON, the political capital of the commonwealth of Massachusetts, the commercial capital of New England, and the fifth city in respect of population in the United States, is situated at the western extremity of Massachusetts Bay, in lat. 42° 21′ 24″ N., long. 71° 3′ 58″ W. from Greenwich and 5° 56′ 17″ E. from Washington. Boston was originally one of several peninsulas jutting into Boston harbor, the narrow necks which connected them with the mainland having no doubt been bars thrown up by the combined action of the tides and the rivers—the Charles, the Mystic, and the Neponset—which flow into the Atlantic through Boston harbor. The topography of Boston has undergone greater changes at the hand of man than that of any other city ancient or modern. When first settled it had an area of but 783 acres; its water-line was indented with numerous deep coves, which at one point cut the peninsula nearly in two; and a short canal, still used within the memory of men now living, gave passage for boats. The striking feature of the landscape as nature left it was three high and steep hills, one of which was surmounted by three sharp peaks, from which the old name "Trimountain," still preserved in the local name Tremont, was derived. Chiefly during the last one hundred years all this has been changed. Leaving out of the account the minor changes accomplished by individual enterprise, the first important undertaking was the levelling of Beacon Hill, which was rendered necessary by the partial excavation near the summit for the construction of the State-House in 1795. A company obtained the right to remove the top of the hill and use the material in the filling of the Mill-pond, so called, at the north part of the town. The right was granted in 1804, but it was not until many years afterward that the work was finished. Beacon Hill was made habitable over its whole area, and 70 acres of land, formerly the Mill-pond, were added to the peninsula. Also in 1804 the legislature gave authority to a corporation to fill in the flats on the east side of Boston Neck. A tract of 9 acres was added by this improvement. By the filling of the South Cove between 1833 and 1837 another tract of 77 acres was added to the dry land. In 1857 was begun the work of filling the Back Bay, a step which was made inevitable as long ago as 1814, when authority was given to the Boston and Roxbury Mill corporation to enclose the waters of the Charles River basin to create a tide-water power. This work has been going on with more or less activity for twenty-five years, and is at last practically completed. These and other minor changes not here mentioned have increased the area of dry land in original Boston from 783 to more than 1850 acres. The natural water-line has been effaced completely; the neck is now the widest part of the city and old Boston is no longer a peninsula. Boston has grown in area also by the absorption of adjoining territory. The first acquisition was what is now known as South Boston, but which was, at the beginning of the century, Dorchester Neck. The annexation was made by act of the legislature in 1804. In 1833 the settlement of East Boston, previously known as Noddle's Island, was begun. In 1855, Washington Village, another district of the town of Dorchester, was added to Boston. The ancient town and city of Roxbury was made a part of Boston at the beginning of 1868; Dorchester was added in 1870; and in 1874 the city of Charlestown and the towns of Brighton and West Roxbury. No annexations have since taken place. The present area of Boston, including all the annexed territory, is about 23,700 acres.

Politically, Boston is divided into twenty-five wards, but the popular division disregards ward-boundaries altogether. The city proper consists of the North End, once the fashionable part of the town, but now occupied by sailors' boarding-houses; the Central District, devoted to the wholesale and retail trade of Boston; the South End, occupied for the most part by residences; and Beacon Hill and the Back Bay, the court end of the city. The annexed districts bear, usually, the old local names,—East Boston, South Boston, Brighton, Dorchester; Roxbury, however, is indifferently termed Roxbury and "the Highland district;" West Roxbury is usually called "Jamaica Plains;" and Charlestown is sometimes spoken of as "the Bunker Hill district." Except upon the new land the streets of Boston are laid out very irregularly, although during the last half century immense sums of money have been spent in widening and straightening the avenues. At the North End particularly the streets and lanes are a maze in which a stranger, and even a native, might easily be lost. At the South End and upon the Back Bay, and also in South Boston, the system of streets is rectangular.

The harbor of Boston is enclosed between the two promontories known as Point Shirley, in the town of Winthrop, and Point Allerton, in Hull. It is further protected by Deer Island, which lies across the mouth of the harbor near Point Shirley, the narrow passage between the two being known as Shirley Gut. The space enclosed is about 70 square miles. The harbor contains numerous islands, the most important of which are—East Boston, formerly Noddle's Island, now connected with Chelsea by bridges; Deer Island, where are situated the city penal and pauper establishments; Long Island, which bears a lighthouse and a fortification; George's Island, on which is situated Fort Warren, the outer defence of the harbor; and Castle and Governor's Islands, at the entrance to the inner harbor, upon which are respectively Fort Independence and Fort Winthrop. Castle Island was the first island in the harbor to be fortified; works were erected there in 1633. These were subsequently rebuilt, and named Castle William in honor of William III. It was this fortification which proved the weakness of the British occupation of Boston in 1776, when Washington transferred his army from Cambridge to Dorchester Heights and threatened the fort from the land-side. Boston harbor is well lighted—from the lighthouse on Long Island; by the "Bug Light," opposite Point Allerton; and by Boston Light, without the harbor, on Lighthouse Island, among "the Brewsters." The last-named light stands 98 feet above the sea. It is a revolving light, and can be seen from a distance of 16 miles. Within, the harbor is most irregular in shape. A great shallow bay is enclosed by the peninsula which forms the town of Hull, and South Boston Bay, the inner harbor, and the mouths of the Neponset, Mystic, and Charles rivers were deep indentations which the filling of flats and the construction of numerous bridges have now blotted out or concealed. Most of the islands in the harbor, together with those lying outside, form a part of Boston, and not a few are the property of the city in fee. Certain parts or the whole of other islands have been ceded to the United States Government for fortifications or lighthouses.

The bridge system connecting Boston proper with other parts of the city, since annexed, is very extensive. The first bridge connected Boston and Charlestown, and was constructed by a private company in 1785. The longest bridge was that long known as the Mill-dam, which was not far from a mile and a half in length, but which has now become, by the filling of the Back Bay, merely the southerly bank of the Charles River. There are now, besides railroad bridges, five bridges to South Boston, two to Charlestown, and two to Cambridge.

Boston was settled on the 17th of Sept., 1630. The Massachusetts Company, under Gov. John Winthrop, coming chiefly from Boston in Lincolnshire, had determined that the place of final settlement should be called Boston, and the application of the name to "Trimountaine" established the capital of the colony. In a few years religious disputes arose, and in 1638 many citizens, being expelled, went to New Hampshire, to Rhode Island, and even to the Dutch territory of New Netherland. The evil effects of this loss of prominent citizens were lasting. In the same year "the public school at Newtown" (Cambridge) received the bequest from the estate of Mr. John Harvard which transformed it into Harvard College, and in 1639 the first printing-press in New England was set up at Cambridge. Early in 1638 a military company was formed at Boston, which still survives as the Ancient and Honorable Artillery Company, although it was in a state of suspension during the Revolutionary War. In 1645 two negro slaves were brought to Boston. They were probably not the first who were held in bondage in the colony, but the fact that they had been stolen in Africa caused great exment and indignation, and the General Court ordered that they should be returned to Guinea. It 1651 a mint was established at Boston, and in the following year the first of the well-known "pine-tree shillings" were coined. The interest of Boston in the stirring events of English history in the seventeenth century was keen, but only on the most important occasions was there any public action. In 1676 the town was visited by fire. Forty-six dwelling-houses were burned, together with the meeting-house of the second church. This event led to the establishment of a fire department, but in 1679 there was a second fire, which consumed eighty dwelling-houses and seventy warehouses, and raged for about twelve hours. Trouble was brewing between the king and the colony during the whole reign of Charles II. Hardly had his successor, James II., been firmly seated on the throne when it broke out. The charter was declared vacated, and Sir Edmund Andros was sent over in 1686 to govern in the king's name. The new government was a tyranny, but in 1689, on hearing of the declaration of the prince of Orange, the people rose, and in two days the governor had been deposed, the government and fortifications of Boston had been surrendered to the people, and the power was in the hands of a "council of safety." Religious and kindred questions again came to the front about this time. The witchcraft delusion was the occasion of great excitement in Boston, as well as in Salem, in 1692. In 1711 another great fire swept the town, burning the town-house, the old meeting-house of the the first church, and about one hundred other buildings, and rendering homeless more than that number of families. In 1721 the small-pox, always a dread visitant, broke out with extreme virulence, and on this occasion inoculation was first introduced. A fierce controversy raged over the question. Dr. Zabdiel Boylston was the reformer who urged and practised the new method against a storm of abuse and malignant opposition which is almost inconceivable in our day; but, although he was alone among the physicians of the town, he had the strong support of the Rev. Dr. Cotton Mather, and finally triumphed. The ravages of the disease were dreadful. Fully one-half of the population were attacked, and one in fifteen of all who were living in Boston when the malady appeared died. In Nov., 1747, there were dangerous riots in Boston in consequence of the impressment of many seamen and others by a press-gang sent ashore by Commodore Knowles. It was only by great prudence on the part of the governor and the General Court, then in session, that serious consequences were averted. The attitude of the people at the time showed how rife was the spirit of resistance to any form of oppression from without. In 1750 occurred the first recorded dramatic entertainment in Boston, the play being Otway's *The Orphan, or Unhappy Marriage.* A disturbance caused by some persons endeavoring to force an entrance attracted attention to it, and led to the passage of a law forbidding playhouses. During the English occupation of the town plays were tolerated, but after the evacuation the Puritan laws were again in force. Many attempts were made to secure their repeal, but it was not until 1792 that a theatre was publicly opened in Boston. During the early morning of the 18th of Nov., 1755, seventeen days after the great earthquake at Lisbon, Boston was shaken to its foundations by an earthquake. Great injury was caused to buildings, especially upon made land, and the people were terribly frightened. A great fire began soon after midnight on the morning of the 20th of March, 1760, which consumed 349 dwelling-houses, rendered 1000 families homeless, and occasioned a loss of not less than £100,000. Public relief for those in distress from this calamity was necessary, and liberal donations were made by other provinces and in England.

We approach now the time when the differences between the colonies and the mother-country deepened and increased. Its position as capital of the province and chief port, and the large number of men like Otis, Hancock, Samuel Adams, Warren, and others, gave Boston a commanding lead in the stirring events which led to the Revolution. Nowhere was the excitement over the British tax-measures greater or the determination to resist them to the end more general. As early as 1764 there was a movement against the importation of taxed articles, which extended even to the discontinuance of the custom of dressing in black after the death of relatives. Aug. 14, 1765, there was a riot in opposition to the Stamp Act, and a building supposed to be intended for a stamp-office was demolished by the mob. This was the first of a series of riots in the course of which the residences of several prominent royal officers were sacked and His Majesty's ministers were many times burnt in effigy. The news of the repeal of the Stamp Act was celebrated with great enthusiasm, with the ringing of bells, artillery salutes, displays of flags, bonfires, and illuminations, and a special day of thanksgiving was appointed by the governor. The contest between the patriot party and the royalists was not, however, suspended. In 1768 there was a renewal of riots, the object of popular fury being the collector of customs. In the latter part of that year troops were ordered to Boston, and the town was placed under military rule. This, of course, only added fuel to the flames. The relations between the popular party and the royal officers and soldiery went from bad to worse. On March 5, 1770, the "Boston Massacre" took place, in which three persons were killed and five wounded by the fire of soldiers. This event intensified the excitement. The years were full of occurrences which widened the breach between the people and their rulers. In 1773 (Dec. 16) a party of Bostonians, disguised as Indians, proceeded to the wharf and emptied into the harbor the tea brought to the port by three Indiamen—a protest against the taxation of the colonies which was answered by the Boston Port Bill. This measure destroyed the commerce of the town and caused great suffering, but so warm was the sympathy of the people of the colonies that ample assistance came from without. Boston was now completely in the hands of the military authorities. From the town marched out the body of soldiers in April. 1775, which was engaged with the farmers on the following day at Lexington and Concord, the departure of the detachment being notified through the Middlesex towns by Paul Revere. At this time there were about 4000 soldiers in the town, and several armed vessels lay in the harbor. The colony was aroused by the events at Lexington and Concord, and in a short time Boston was besieged by the patriot army. The attempt to fortify Charlestown brought on the battle of Bunker Hill, June 17, in which, although the Americans were defeated by lack of ammunition, the patriots gained confidence in their ability to stand against British soldiery. July 2, Washington took command of the army at Cambridge, under a tree which is still standing, and the siege was resumed; but the British were strongly entrenched, and for a long time the efforts to dislodge them were unavailing. But a fine piece of strategy delivered the town. By a long détour Washington transferred a part of his army on the night of the 4th of March, 1776, to Dorchester Heights (now South Boston), threw up hasty entrenchments, and in the morning occupied a position from which he commanded both the town and the forts in the harbor. Aided by bad weather, which prevented the British from making an immediate attack, the fortifications were made secure, and on the 17th of March the British were forced to evacuate, sailing away with all their military and naval forces. Boston, thenceforward delivered from the enemy, joined with enthusiasm in the movements which led to independence, and contributed its full share to the Revolution both in the field and in the council. After the war closed she experienced, with the rest of the country, a revival of industry, commerce, and wealth. The Embargo and the War of 1812 inflicted a blow upon her from which she was long in recovering. In 1822, after a long agitation of the matter, a city charter was granted to Boston, which was accepted by the citizens by a large majority, and John Phillips was chosen the first mayor. On the 1st of Jan., 1831, was issued the first number of *The Liberator*, the anti-slavery newspaper of William Lloyd Garrison, and then began in New England the serious consideration of the great issue which was afterwards to lead to civil war. In November of the same year was formed the first anti-slavery society, and many of those who were present at the first meeting lived to see the objects of their association fully carried out more than thirty years later. There was a very strong opposition in Boston to the society, and numerous public and private remonstrances were made against its principles. In Oct., 1835, occurred the famous "Garrison mob," remarkable chiefly in the character and standing of the men engaged in it. On June 11, 1837, occurred the Broad Street riot, originating in a collision between a fire company and an Irish funeral procession. Nearly 15,000 persons were engaged in it, and, although no lives were lost, there were numerous wounds and injuries. The Cunard line, the first steamship line between Europe and America, was established in 1840; the Britannia, the first regular steamer, was entered at the custom-house July 20 of that year. The energy of Boston merchants of that day was illustrated in Feb., 1844, when, the harbor being obstructed with ice, they raised the money to cut a canal four miles long to the open water, which was done, and the Britannia sailed only two days later than her advertised time. Water was introduced from Cochituate Lake in 1848. A very serious epidemic of Asiatic cholera occurred in 1849. During that year the deaths in Boston numbered 5080, a large proportion of them being from the prevailing malady, the population of the city being 130,000. Boston was much excited in 1851 over the return of Sims, a fugitive slave. In the same year there was a great celebration of the completion of the railroad line connecting Boston with Canada. In the War for the Union, Boston took a very active part, but was the scene in 1863 of a riot against the draft, which was confined to the North End, the quarter containing the lowest class of the population. In 1866 the Massachusetts legislature passed a law allowing Boston to assess upon property-holders a part of the expense of street improvements. This law, for which the city had long been asking, has enabled Boston to straighten and widen its avenues and to open new lines of travel —at the cost of a heavy increase of the debt, it is true, but to the great advantage of the city. Two great musical jubilees were held in the summers of 1869 and 1872, respectively, which attracted great attention and drew vast crowds of people to Boston. On the evening of Nov. 9, 1872, began the greatest fire which ever took place in Boston. Beginning at the corner of Summer and Kingston Streets at about quarter-past seven o'clock, it raged almost unchecked until after the noon of the next day, and during that time it burned over a space of about 65 acres, densely covered with stores and warehouses in various departments of wholesale trade. Fourteen lives were lost in this great fire. The number of buildings destroyed was 776, of which all but 67 were of brick or stone. The value of the property destroyed was about $75,000,000. For some days after the fire the city was patrolled by State troops in order to prevent pillage and crime, but in no case were their services required. There was a rapid recovery from this calamity of fire, and in less than two years the entire district was rebuilt upon with buildings much more substantial and sightly than those which had been destroyed. But the loss retarded the growth of Boston, nevertheless. The two hundred and fiftieth anniversary of the settlement of Boston was celebrated with a great pageant on Sept. 17, 1880.

The population of Boston increased but slowly until about the beginning of the present century. Although it was for a long time the largest town in America, and although it has always been the largest in New England, yet it was, even when occupying the leading position, no more than a town. None of the modern methods of business and travel had the influence, so marked in our day, which creates great cities. Seventy years after Boston was settled, at the close of the seventeenth century, it is believed that the population was about 7000. In 1741 there was a census which seems to have been taken with some accuracy, and the number of inhabitants is set at 16,382. From that time on, for nearly fifty years, the population was nearly stationary. Indeed, a colonial census taken in 1764–65, under the administration of Sir Francis Bernard, gives the population as 15,520. The political troubles which followed greatly retarded the growth of Boston, and her increase was less than that of the colony as a whole. The first United States census (that of 1790) gave Boston a population of 18,038, and from that time onward the increase has been rapid. In 1800 the population was 24,937; in 1810 it was 33,250; in 1820 it was 43,298; in 1830 it had increased to 61,392; in 1840, to 93,383; in 1850, to 136,881. Up to about this point the growth had been largely due to the occupation of new territory—South Boston in 1800, East Boston about 1835, and "made" land or hills made habitable by being cut down at various times. But the density of population was increasing slowly at the same time. Between 1850 and 1860 the work of filling in the Back Bay was begun, and a large amount of new territory was thereby added. The population in 1860 was 177,840. During the next decade Roxbury and Dorchester, with a population (in 1860) of 34,906, were annexed, and in 1870 the population of Boston was 250,526. In the following years the city of Charlestown and the towns of Brighton and West Roxbury were absorbed, having in 1870 a combined population of 43,973, and the census of 1880 gave Boston a population of 362,839.

The city government of Boston under its many-times amended charter resembles those of other large cities in most of its essential features. The mayor is elected annually in December. The city council is composed of a board of aldermen and a common council. The board of aldermen consists of 12 members, chosen annually on a general ticket by all the voters. Its powers are much greater than those of the common council, which is made up of 72 members, who are chosen by wards,—three each for every ward except the twenty-second, which elects two councilmen, and the twenty-fifth, which elects but one. The general concerns of the city are in charge of these bodies, either of the aldermen alone or of the two boards acting in concurrence. But the police, the streets, the fire department, the water-works, the parks, and the public health are directly administered by commissions, consisting usually of three members each, appointed, one a year, for a term of three years, by the mayor, and confirmed by the two boards acting independently of each other. The street commissioners are, however, elected by popular vote. The police commission acts also as a licensing board. The street commission is not empowered to spend more than a fixed sum in any single year upon any one street without the consent of the city council. In general, as the city council holds the purse-strings, all the boards are to a certain extent answerable to the council, and the mayor may make removals for cause.

Boston has always been comparatively wealthy. From its foundation it was the financial metropolis of the colony, and up to about the time of the Revolution it was the richest, as well as the most populous, town on the continent. Its increase in wealth during the present century has been very rapid. The valuation of the real and personal property for purposes of taxation since 1800, at intervals of ten years, has been as follows, the sum mentioned being as nearly the true value of the property as possible:

1800	$15,095,700	1850	$180,000,500
1810	18,450,500	1860	276,861,000
1820	38,289,200	1870	584,089,400
1830	59,586,000	1880	639,089,200
1840	94,581,600		

The maximum valuation was reached in 1874, when it was $798,755,050, after which there was a steady annual loss during the years of depression in business until 1879, when the upward movement began. The valuation in 1881 was $665,554,600, and in 1882 it was $672,490,100. Of this last-named sum, $467,704,100 was real, and $204,785,000 personal, estate. The rate of taxation in recent years has ranged from $10.50 on each $1000 of valuation in 1862 to $15.80 in 1865. The rate in 1881 was $13.90; in 1882 it was $15.10, this sum covering the city, county, and State expenditures.

The real beginning of banking in Boston was in 1782, when a branch of the Bank of North America, founded in Philadelphia, was opened. Its success was sufficient to lead to the establishment of the Massachusetts Bank, which was chartered in 1784, and began business on July 5th of that year. It is still in flourishing existence. Other banks were soon established, and the business increased. (See BANKING.) During the Civil War all the Boston banks transformed themselves into national banking institutions. The present number of national banks is fifty-nine. Their aggregate capital is slightly in excess of $50,000,000, and their accumulated profits are $15,000,000. Most of the banks are members of the clearing-house association, organized in 1856. The maximum amount of individual deposits ever reported by the clearing-house banks was $70,000,000, and the largest amount of bank loans was $116,000,000. The first savings bank in the country was the Provident Institution for Savings, which began business in Boston in 1816. The system became very popular through Massachusetts and New England, and with one or two exceptions it has been very prosperous and useful.

The schools of Boston bear a high reputation. They are under the care of the school committee, which consists of the mayor, *ex-officio* chairman, and 24 members, 8 being chosen at large by general popular vote every year for a term of three years. The superintendent of schools and a board of supervisors act under the direction of the school committee, by whom they are chosen. The schools are—a normal school, the Public Latin School, the Girls' Latin Public School, the English High School, the Girls' High and Normal School, high schools in Roxbury, Dorchester, Charlestown, West Roxbury, Brighton, and East Boston, 51 grammar schools, 438 primary schools, and 22 special schools. In 1882, there were, excluding 55 masters for all the schools, 62 teachers in the high schools, 545 in the grammar schools, and 422 in the primary schools. The average number of pupils in attendance during the preceding half year was 2044 in the high schools, 25,028 in the grammar, and 19,810 in the primary schools—a total of 46,882. During the year ended April 30, 1882, the city paid for supervision of schools $55,994; for salaries of instructors, $1,109,636; and for miscellaneous expenses, $225,962. The school-houses in Boston are many of them models of convenience. The Girls' High School, on West Newton Street, was completed in 1870 at a total cost of $310,717. It has a frontage of 144 feet, contains 66 separate apartments, and accommodations for 1225 pupils. The New English and Latin High School building, on Appleton Street, was dedicated and occupied in 1881. Its cost, including the land, was $750,800. The lot of land is 423 feet long and 220 feet wide, and the building occupies the whole of it except two court-yards for play-grounds. There are a drill-hall, a gymnasium, a lecture-room, and 48 school-rooms, and the building is constructed throughout in accordance with the most approved modern ideas of school architecture.

The water-supply of Boston is obtained from Lake Cochituate, situated chiefly in the town of Natick, 20 miles west from Boston; from the Sudbury River; and from Mystic Lake. The original supply was from Lake Cochituate. After a long agitation on the subject of pure water, the works were begun under the administration of the younger Quincy, and completed while he was still mayor, in 1848. In progress of time the supply from this source became insufficient, and leave was obtained from the legislature to take water from the Sudbury River. The Mystic water-works were acquired by Boston as one of the results of the annexation of Charlestown. The main water-works system is very extensive. There are three large storage-basins along the Sudbury River and a large lake known as Farm Pond, the water from all of which can be, and sometimes is, carried to the city through Lake Cochituate, though there is an independent line which avoids the lake. Lake Cochituate covers some 650 acres. The water is brought thence by a conduit to a small reservoir of 23 acres in Brookline, and to the Chestnut Hill reservoir on the border of Newton, of 125 acres, having two basins with a capacity of 730,000,000 gallons, surrounded by a magnificent driveway. From these reservoirs the water is brought directly to Boston. The high service is provided for by means of a standpipe in the Roxbury district, the base of which is 158 feet above tide-level and its height 80 feet, giving a sufficient head for the water of the entire city, its capacity being equal to a full supply. The amount which is actually pumped at the standpipe is, however, only one-tenth of the whole. The fine granite reservoir on Beacon Hill was long disused, and has now (1883) been taken down. During the year 1881 the Sudbury River water-shed was drawn upon for 9,036,000,000 gallons of water. From this source and the lake itself were supplied to Boston nearly 11,400,000,000 gallons, and from the Mystic works 2,600,000,000 gallons, giving a daily supply of 92 gallons per head of the population. The cost of construction of the Cochituate (including Sudbury River) water-works to the 1st of May, 1882, was $16,943,863.87, and of the Mystic works, $1,634,108.82. The money was raised by loans, of which $11,631,274 Cochituate and $1,127,000 Mystic were outstanding on the date just given. The revenue from water-rates, etc., during the preceding year was $1,373,514.44. The interest paid was about $660,000, and the ordinary expenses were $406,000, leaving an ample surplus for the sinking fund.

The sewerage system of Boston is undergoing a radical change. Heretofore, the main sewers of the city proper have emptied themselves into the Charles River and into the harbor. At present the city is constructing an intercepting sewer, which, beginning at Beacon Street on the Back Bay, passes southerly and easterly between Boston proper and old Roxbury.

through South Boston to the bay, and thence by land and by tunnel to Moon Island in the harbor, where the sewage will be discharged. Up to Jan. 1, 1882, the amount expended upon this work was $2,396,960.68. The amount appropriated was $3,753,000, but this sum will be largely exceeded before the work is finished. The total length of the sewer will be 65,408 feet, of which 7004 feet will be a tunnel under Dorchester Bay.

The park system of Boston is yet incomplete. Boston Common is perhaps the most famous enclosure of the kind in America, although it embraces but 48 acres. It was a part of the purchase from Mr. Blackstone in 1634, and was used as a cow-pasture until within the memory of living men. It was shorn of a part of its area, all that space now included between Park, Beacon, and Tremont Streets, but has been enlarged at the lower end. Many attempts have been made to cut into the Common for street-widenings, and even to extend streets across it; but they have all failed, and by an act of the legislature passed in 1878 it is protected from encroachment unless a majority of the citizens shall vote in favor of the measure. The Common is pleasantly varied in its landscape effects, and is beautifully shaded by many magnificent trees. On its westerly side is the Public Garden, a tract of 21 acres, which is land reclaimed from the water, and which was given to the city by the commonwealth on condition that it should be filled in and for ever kept free of all buildings except a city-hall. In addition to these open spaces, which have the great advantage of a situation in the heart of the city, there are many small parks and squares. Of late there has been a movement in favor of a large extension of parks, and the policy has been fully adopted of constructing a connected series of parks. The land has been purchased, but many years will elapse before the system will be complete. The several parts of the system are as follows: (1) the Charles River Embankment, on the north side of Beacon Street, a space nearly 2¼ miles long and 200 feet wide, an area of about 69 acres; (2) the Back Bay park, land, and water, a space of about 106 acres; (3) the Muddy River improvement, connecting the Back Bay Park with Jamaica Pond and Park by way of Brookline, comprising 110 acres; (4) Jamaica Park, a driveway wholly around Jamaica Pond, comprising 52 acres, besides the pond of 70 acres; (5) the Arnold Arboretum, of 167 acres; and (6) the West Roxbury Park, of 485 acres. This will make a series of parks aggregating 1059 acres, and the length of the whole system will be not less than 8 miles. There are also to be parks at City Point, South Boston, and in East Boston, and perhaps another in connection with the Chestnut Hill reservoir at Brighton.

Among the public buildings of Boston the most famous is Faneuil Hall, "the cradle of liberty." It was erected and given to the town for a market-house in 1742 by Peter Faneuil. It was partly destroyed and rebuilt in 1761, and enlarged in 1805, so that at present it covers nearly twice its original area. The hall, which alone has historical associations, is in the second story. It is 76 feet square and 28 feet high. The walls are adorned with numerous portraits of eminent Americans, including a fine original portrait of Washington by Stuart. The circumstance that this hall was the place for all town meetings for nearly eighty years, from the time of its erection until the adoption of the city charter, pointed it out as the place also of other public meetings. Here the citizens of Boston met to deliberate during the stirring years before the Revolution, and to the present time it is used for large popular assemblies whenever public or political questions are to be discussed. Hardly second in interest is the Old South Church. This was formerly the place of worship of the Old South Society, the third church organized in Boston, and is the second edifice of that parish. It was built in 1730. In the Revolutionary period it was customary to adjourn meetings of citizens, when Faneuil Hall was too small to hold all who assembled, to this church. Here Joseph Warren delivered his fearless oration on the anniversary of the Boston Massacre. During the British occupation it was used as a cavalry riding-school. From the year 1712 for about 160 years, with a few interruptions, the annual "Election" sermon was preached in this church—the custom during all that period and down to the present time being for the State government to "attend divine service" on the completion of the organization of the legislature. The religious society had already determined to abandon the old structure for a new one on the Back Bay when the great fire of 1872 occurred. The building, which was at that time almost miraculously preserved from destruction, was immediately leased to the Government for a post-office, and was so occupied until the completion of the new post-office in Dec., 1874. It was afterwards sold to an association formed to preserve it as an historical landmark, and is now open as a museum of New England antiquities. The Old State-House, at the head of State Street, was erected in 1748, and was long used, as its name indicates, for State offices and for the meetings of the legislature. On the formation of the city government it was used as a city-hall. Subsequently it was remodelled, and for many years was leased for a great variety of business purposes. It has lately (1882) been restored to very nearly its original appearance both within and without, and is open to the public. The present State-House, the most conspicuous public building in Boston, standing as it does on the summit of Beacon Hill, was begun in 1793, and completed five years later. The land was purchased of Gov. Hancock's family. The building is 176 feet front on Beacon Street and 61 feet deep, and is surmounted by a fine gilded dome 50 feet in diameter and 30 feet high. From the cupola at the top, 230 feet above the sea-level, is to be obtained a grand view of the surrounding country and the harbor. The State-House has been once enlarged by the extension of its rear to Mount Vernon Street, increasing its depth, and has been several times remodelled internally. Most of the State offices are located in it. In front of the building stand the statues of Daniel Webster and Horace Mann. In the rotunda, Doric Hall, are the Chantrey statue of Washington, a statue of Gov. Andrew, busts of Samuel Adams and Abraham Lincoln, some famous Revolutionary cannon, the battle-flags borne by Massachusetts regiments during the Civil War, and many other historical relics. Near by are the tablets taken from the monument which formerly stood on the top of Beacon Hill before it was cut down. In the Hall of Representatives hangs the ancient gilded codfish, the emblem of early Massachusetts industry, and in the Senate Chamber are numerous portraits and relics of the early days. The city-hall in School Street is an imposing structure of fine white Concord granite, in the Italian Renaissance style, with modern French modifications, and surmounted by a louvre dome. It covers 13.927 feet, was begun in 1862, and completed in 1865 at a cost of $505,691. The county court-house is a plain and inconvenient structure of dingy Quincy granite, situated in the rear of the city-hall. The county-jail, located in Charles Street, near Cambridge Street, was built in 1849. It is of Quincy granite, 70 feet square, and 85 feet high, with four wings. The reformatory and correctional institutions of the city are upon Deer Island, at the mouth of the harbor. The United States custom-house is located on State Street. It is a granite structure of great strength and solidity, in the pure Doric style of architecture, and completely fire-proof, the entire exterior, even to the roof of the dome, being of stone. It was begun in 1837, and completed in 1849 at a cost of $1,076,000. The post-office and United States court-house, begun in 1870, although the "corner-stone" was only laid in Oct., 1871, will be completed in 1883. It occupies the entire square bounded by Milk, Devonshire, and Water Streets and Post-Office Square, and will have cost, when completed, not much less than $7,000,000, including the land. It is constructed of fine Cape Ann granite. The Devonshire

Street half was occupied by the postmaster in Dec., 1874, and the upper part of the building was occupied by the United States assistant treasurer soon afterwards. On the completion of the building the United States courts will have quarters in it.

Among semi-public buildings of more or less architectural merit may be mentioned the fine Masonic Temple, the building of the Boston Society of Natural History, of the Institute of Technology, of the Museum of Fine Arts, the Public Library, the Boston Athenæum, Horticultural Hall, and Odd Fellows' Hall.

Boston has a good supply of theatres and halls for public entertainments, and additions are frequently made to the number. The Boston Theatre, the largest regular place of amusement in New England, on Washington Street between West and Avery Streets, was erected in 1854 by a stock company, but has since passed into private hands. It has, in the auditorium, with its parquet and three galleries, seating-room for 3000 persons. Its stage is one of the largest and finest in the country. The Boston Museum, of late years much more a theatre than a museum, although the latter is still kept open, was built and opened in 1846. The Globe and Park Theatres, both in Washington Street, near Boylston, are of more recent origin, and there are many minor theatres. The two largest halls in Boston were built in 1881 for exhibition and fair purposes—the one by the Massachusetts Charitable Mechanics' Association, the other by the Manufacturers' and Mechanics' Institute. They are both situated in Huntingdon Avenue, and each covers a large area. Several very successful fairs have been held in them, and they have also been used for mammoth entertainments. The most famous hall is the Boston Music Hall, built in 1852. The main hall is 130 feet long, 78 feet wide, and 65 feet high, the proportions being as 10, 6, and 5, and the acoustic properties are admirable. The hall has two tiers of galleries on three sides. The great organ, although surpassed in size by some other instruments in the country, ranks among the finest in the world. It was contracted for in 1856, and finished, delivered, and set up in 1863, and, with its case, cost upwards of $60,000. The builder was Fr. Walcker, of Ludwigsburg, Würtemberg. The organ has 84 complete registers and 5474 pipes, of which 690 are in the pedal organ. In front of it stands Crawford's fine bronze statue of Beethoven. The hall is the home of music in Boston. Tremont Temple, in Tremont near School Street, is owned and occupied on Sundays by a Baptist society, but is much used on other days for lectures and concerts. It was destroyed by fire a few years ago, and was rebuilt in more commodious and elegant style. It is furnished with a fine organ.

Boston is adorned with many statues and monuments. The most imposing and famous monument is that on Bunker Hill, in the Charlestown district. The site of the battle-field was bought by an association, and the corner-stone of the monument was laid on the 17th of June, 1825, on the fiftieth anniversary of the battle, with Masonic ceremonies. La Fayette was present, and Daniel Webster delivered the oration. The monument was finished in 1843, and was dedicated in that year, Webster being again the orator. In the city proper there are numerous statues: of Franklin and Josiah Quincy in the city-hall yard; of Webster and Horace Mann in the State-House yard; of Columbus and Aristides in Louisburg Square; of Washington (equestrian), Everett, and Sumner in the Public Garden; of Samuel Adams in Washington Street near Dock Square; of Winthrop in Scollay Square; of Alexander Hamilton and John Glover in Commonwealth Avenue; and others. There are also a monument commemorative of the discovery of anæsthetics in the Public Garden; a copy of the Emancipation group in Park Square; and a stately monument in memory of the soldiers and sailors of the Civil War on Flagstaff Hill on the Common.

The cemeteries within Boston, as well as those beyond the limits which are used for the interment of deceased residents of Boston, are extremely interesting. The first established is now known as the King's Chapel burying-ground, because it adjoins that place of worship. But the land on which the chapel stands was filched from the common burying-ground by the royal governor, and the cemetery is not in any proper sense the "churchyard." Here are buried John Winthrop, his son, and his grandson, all colonial governors, and also some of the most famous of the early Boston divines. The "Granary" burying-ground, adjoining Park Street Church, and Copp's Hill burying-ground, were established about 1660. The former is the resting-place of no less than nine colonial and State governors, including Bellingham, Hancock, and Samuel Adams. Here are also interred Paul Revere, Peter Faneuil, Judge Samuel Sewall, and a great list of men who have been famous in the history of Boston from the beginning. Copp's Hill is less imposing in the list of its occupants, but it is interesting from the fact of its having been a military station of the British soldiery during the siege, and many of the gravestones still bear the marks of defacement by bullets. Interments in all these graveyards have practically ceased, as well as in some other intramural cemeteries. The most extensive burial-places at present are Mount Auburn Cemetery in Cambridge and Watertown; Forest Hill and Mount Hope in the West Roxbury district; and Holyrood (R. C.) in Newton.

In educational and literary institutions, aside from the public schools, Boston takes a high rank among the cities of the country. The BOSTON UNIVERSITY (*q. v.*) was founded in 1869 by the generosity of Isaac Rich, a prominent member of the Methodist Episcopal Church, who bequeathed for the purpose nearly $2,000,000. Its plan differs from that of most institutions of the kind in that no provision is made for resident students. The Massachusetts Institute of Technology, which was chartered in 1881, gives instruction in practical branches of education. It has a corps of 40 teachers, and gives instruction to about 400 students. Boston College is under the care of members of the Jesuit society, and is connected with the church of the Immaculate Conception. There are numerous minor schools, which cannot be enumerated. The Boston Public Library is exceeded in the number of volumes it contains only by the Library of Congress. It originated in a gift by Joshua Bates, a wealthy banker of London, but in early life a resident of Boston. Other gifts were also made. The land was purchased and a building was erected, and finished at the beginning of 1858. Since that time the growth of the library has been very great. From a total of 9688 volumes in 1852 it had grown to 97,386 volumes in 1860, to 179,250 volumes in 1871, to 404,221 volumes in 1882. Meantime, branch libraries have been established in all the outlying districts of the city, whose contents are embraced in the above statistics. The motto of the library is "Open to all." Books may be taken for hall reading by all comers, and the privilege of taking volumes for home use is easily secured by complying with certain formalities. Among the treasures of the library are the valuable collection, 4000 in number, of Spanish and Portuguese books and manuscripts made by the late George Ticknor, and the famous Barton library, which was purchased outright with an appropriation made by the city council at the request of the trustees, the special object of the appropriation not being revealed to the city council until the purchase had been made—a fact which illustrates the liberal spirit of the city government toward the library. The Boston Athenæum is the successor of the Anthology Club, founded in 1804. It assumed its present form in 1807. Since 1849 it has occupied a fine building on Beacon Street. Until within a few years the association possessed, in addition to the library, a fine picture-gallery and collection of statuary, but these latter have now been transferred to the Museum of Fine Arts. The library and extensive reading-room are nuinally open only to members of the association, but both are conducted on a generous plan toward the general public. The library contains something more than 100,000 volumes. In addition to these are many special libraries of large size: those of the Boston Society of Natural History, of the Handel and Haydn Society, of the Young Men's Christian Association and the Young Men's Christian Union, the General Theological Library, that of the Massachusetts Historical Society, of the New England Historic-Genealogical Society, of the American Congregational Association, the Social Law Library, and others.

The public and private charitable and benevolent institutions of Boston are very numerous—so numerous, in fact, that an accurate ascertainment of the number at any time is difficult. A directory of the charities of Boston, compiled in 1880 by the Associated Charities, gave a list of 220 different public and private organizations, exclusive of the churches. Six of these date back to the first seventy years of Boston history, and twenty of them were founded before the year 1800. One of the oldest important institutions of this class is the Massachusetts General Hospital, incorporated in 1811. The hospital building, erected in 1818, but since greatly enlarged, stands on a tract of four acres of land at the corner of Allen and Blossom Streets. It is of granite, and is 274 feet front and 54 feet deep, with a portico of eight Ionic columns. Its general fund, partly derived from grants by the State and partly from private bequests and gifts, amounts to $2,500,000. During the year 1881 the number of patients treated within the hospital was 2280, in addition to 18,443 out-patients. The McLean Asylum for the Insane, at Somerville, is a branch of the Massachusetts General Hospital. The City Hospital, a fine building opposite Worcester Square, between Harrison Avenue and Waltham Street, was established in 1864. The institution occupies seven acres of land. The hospital consists of a main building and three pavilions, two of which are connected with the main building by curved corridors. The hospital is supported by the city, but those who are able to do so frequently pay for their treatment. During the year 1881 the hospital contained an average of 273 patients. The whole number was 4707, besides 10,605 out-patients. The Carney Hospital is under Roman Catholic management and publishes no reports, but performs a highly useful service. The Massachusetts Homœopathic Hospital is an institution of recent origin. During the year 1881 it cared for 209 patients. There are numerous special charities, like the free dispensary in Ash Street, the eye and ear infirmary in Charles Street, and the Consumptives' Home and Cancer Hospital at Grove Hall in the Roxbury district. The charitable work of the city is now organized under the name of the Associated Charities, which association works in close harmony with the city government and has quarters in the city's charity building in Chardon Street.

There were 219 church organizations in Boston in 1883. Some of these are but mission chapels, but the most of them are fully organized societies, worshipping each in its own church building. The churches are divided denominationally as follows: Protestant—Congregational Trinitarian, 29; Congregational Unitarian, 30; Methodist Episcopal, 28; Independent Methodist, 4; Baptist, 27; Protestant Episcopal, 22; Universalist, 11; Union, 9; Presbyterian, 8; Lutheran, 5; Second Advent, 3; Christian, 2; Swedenborgian, 2; Friends, 1;—Catholic Apostolic, 1; Roman Catholic, 29; Jewish, 8. The first church in Boston, Unitarian, was organized in 1630, and is still in a prosperous condition. Its house of worship, a modern structure, is on Berkeley Street, Back Bay district, and was occupied in 1868 for the first time. The oldest church edifice in the city is Christ Church, Episcopal, in Salem Street. It was built in 1723, and is the only building ever occupied by the society. King's Chapel, the congregation of which was formerly Episcopalian, but now a Unitarian church having a liturgy of its own, was erected in 1754, and preserves within the original and quaint appearance of the last century. It contains the first organ ever used in a church service in America. Among the finest edifices from an architectural point of view are Trinity (Episcopal), the Old South and the Central (Congregational Trinitarian), and the First Church on the Back Bay; the Roman Catholic cathedral and the Church of the Immaculate Conception at the South End.

The first newspaper printed in America was the *Boston News-Letter*, which was issued on the 24th of April, 1704, by John Campbell, then postmaster. This journal was published, at first weekly and afterward semi-weekly, for seventy-two years, when it ceased with the evacuation of Boston by the British. The second newspaper was the *Boston Gazette*, begun in 1719; and the third was the *New England Courant*, begun in 1721. With both the latter the Franklins were connected, and Benjamin Franklin's name was for a time printed as that of the publisher of the *Courant*. The press of Boston played a great part in the Revolutionary times. The first successful daily newspaper in Boston was the *Advertiser*, which was started in 1813, and is still published. There are at present (1883) 2 daily morning, evening, and Sunday papers; 2 daily morning and evening papers; 2 daily morning papers; 2 daily evening papers; and about 150 other periodicals, semi-weekly, weekly, monthly, bi-monthly, and quarterly, political, religious, social, literary, medical, and trade papers.

From the very foundation of the town Boston took a leading position in commerce. Within a year from the first settlement the bark Blessing of the Bay was launched, on July 4, 1631, and although she was of only 30 tons burden, she began the trade of the colony with Long and Manhattan islands. In 1644 a ship, the Trial, was built at Boston, which made the voyage to Spain. The foreign commerce grew as rapidly as could be expected, considering the slow growth of the colony, and at the beginning of the Revolution Boston was the first port on the continent. After independence was established the growth of commerce was much more rapid. From an account of Boston written in 1794 we learn that there were then eighty wharves and quays, and a very large foreign and domestic trade was carried on. There were twenty-seven dockyards, and although shipbuilding was then transferred to some extent to other coast-towns, as many as 60 vessels had been launched in a single year, twelve ships having been launched from one yard. During the early part of the present century the prosperity of foreign commerce, interrupted by the Embargo and the War of 1812, was enormous. Great fortunes were made in the India trade, and the enterprise of Boston merchants is well illustrated by the establishment by Mr. Tudor of an ice-trade with Calcutta. Gradually, the first place in the foreign trade was taken by New York, but Boston has retained the second place, its imports being far in excess of those of any other port except New York, while in exports it is surpassed by New Orleans, and occasionally by Philadelphia or Baltimore. During the year ended June 30, 1882, the imports were valued at $69,594,057; the domestic exports at $61,614,526; and the foreign exports at $856,900. The chief articles of importation in 1881–82 were—raw wool, $4,488,177; hides and skins, $6,648,562; sugar, $17,292,072; molasses, $1,251,452; paper materials, $1,766,830; earthenware, $1,032,365; cotton manufactures, $1,724,142; flax manufactures, $1,691,863; crude india-rubber, $992,214; iron and steel in all forms, $6,253,632; tin plates, $1,298,100; fruits, $1,201,532; woollen goods, $2,587,769,—these articles forming about three-fourths in value of all the imports.

A very large amount of manufacturing is carried on in Boston. In the comparison with other cities it suffers somewhat, inasmuch as the manufacture of goods by Boston men and with Boston capital is carried on in suburban and neighboring cities and towns to a greater extent than is the case with any other large city of America. According to the census of 1880, the aggregate amount of capital employed in manufactures within the limits of Boston itself was $42,750,134 in 3521 establishments. The average number of hands employed was 56,813, of whom 17,753 were women and 1229 children. The wages paid to these employés during the census year amounted to $23,715,140; the materials used were valued at $77,586.607; and the products at $123,366,137. The leading manufactures in the list were the following:

Industries.	Capital.	Employés.	Products.
Boots and shoes	$318,775	1350	$1,928,740
Clothing, men's	4,200,193	9280	16,157,892
" women's	319,900	1986	1,808,520
Furniture	1,388,875	2365	3,867,917
Iron and steel	2,663,408	2065	3,641,436
Machinery	4,235,833	3195	5,340,266
Musical instruments	2,140,566	1681	3,107,698
Printing and publishing	2,496,535	2876	5,469,518
Rubber and elastic goods	1,095,000	923	2,095,460
Sugar-refining	1,629,500	395	16,518,760

In addition to these, which are the largest branches of industry, there is a great variety of manufactures on a small scale, the above being but 10 out of 140 enumerated industries, besides 117 others which are grouped together under the head of "miscellaneous industries."

The railroad system of Massachusetts centres for the most part in Boston. There are nine railroads having an independent entrance into the city, and most have extensive areas of land for terminal facilities. Chief among these are the piers of the New York and New England Railroad upon the reclaimed South Boston flats; the Boston and Albany wharves, yards, and warehouses at East Boston; and the Hoosac Tunnel Dock and Elevator Company's property in Charlestown, used by the Fitchburg Railroad Co. There is a large grain-elevator at each of these points, and all of them are employed in loading ocean steamships. The passenger business of the railroads entering Boston is very large. During the year ended Sept. 30, 1882, the several railroads brought the following numbers of passengers, respectively, including season-ticket passengers, into Boston:

Boston and Albany	2,398,045
Boston and Providence	1,469,003
Boston and Lowell	1,705,262
Eastern	2,135,572
Boston and Maine	2,196,582
Fitchbnrg	1,050,782
Boston, Revere Beach, and Lynn	Not stated.
New York and New England	937,342
Old Colony	1,992,334

(E. S.)

BOSTON UNIVERSITY was chartered in the year 1869. Its founders were Isaac Rich, Lee Claflin, and Jacob Sleeper; Mr. Rich bequeathed for the purpose the greater part of his large estate. Its organization comprises several departments. The statutes provide for the establishment of a large group of colleges with distinct faculties and administrations. Departments so organized as to presuppose on the part of the student a collegiate preparation or its equivalent are called schools. Such of these as are organized and administered in the interest of persons preparing for professional life are called professional schools. The following colleges are now in operation: Liberal Arts (established in 1873), Music (1872). The professional schools comprise theology (1871), law (1872), medicine (1873). The post-graduate department, or School of All Sciences, was established in 1874.

The School of Theology was originally projected in 1839; opened in Concord, N. H., in 1847; removed to Boston and reorganized as "The Boston Theological Seminary" in 1867; and in 1871 was adopted with all its property and franchises by the university. In somewhat similar manner the School of Medicine grew out of a preceding institution, "The New England Female Medical College," which, in accordance with a legislative enactment, was transferred to the university in 1873. The School of Theology is the oldest ministerial training-school of the Methodist Episcopal Church.

The university has presented and maintained in theology, law, and medicine uniform graded courses of instruction covering three full scholastic years, and has required this amount of study in order to graduation. It has given four-year courses in medicine, and restored the baccalaureate degrees in medicine and surgery. It gives professional and liberal education to qualified women on equal terms with men. The endowment amounts to $1,000,000, and new buildings have been purchased for the use of the university. In 1882, 65 new scholarships were established in the College of Liberal Arts. In honor of the munificence of the first founder of the university, 64 of these are named the Rich scholarships. The president of the university is Rev. William F. Warren, S. T. D., LL.D.

BOSWORTH, JOSEPH, F. R. S. (1788–1876), an English clergyman and philologist, was born in Derbyshire in 1788. He graduated at Aberdeen as M. A. and LL.D., received the honorary degree of Ph.D. at Leyden in 1831, and the degree of D. D. at Cambridge in 1839. He was ordained deacon in 1814, and became vicar of Horwood Parva, Buckinghamshire, in 1817. From 1829 to 1841 he was British chaplain at Amsterdam and Rotterdam, during which period he translated the Book of Common Prayer into Dutch. He was incorporated as a member of Christ Church, Oxford, in 1857, and shortly afterwards was elected professor of Anglo-Saxon. In 1858 he was appointed to the rectory of Water Stratford, near Buckingham. Dr. Bosworth's studies were devoted to Hebrew, Chaldaic, Syriac, Arabic, and the languages of the north of Europe, particularly Anglo-Saxon. He published *The Elements of Anglo-Saxon Grammar* (1823), and enlarged editions of this grammar appeared later. But his greatest work, on which he was engaged for fifteen years, was his *Dictionary of the Anglo-Saxon Language* (1838). Among his other works may be named *The Origin of the Danish Language* (1834); *Origin of the English, Germanic, and Scandinavian Languages and Nations* (1836); *A Compendious Anglo-Saxon Dictionary* (1848); *King Alfred's Anglo-Saxon Version of the Historian Orosius*, with an English translation (1855); *King Alfred's Description of Europe, and the Voyages of Othere and Wulfstan*, with an English translation (1855); *The History of the Lauderdale MS. of Orosius* (1858); *The Gospels in Gothic of 360, and in Anglo-Saxon of 995, in parallel columns with Wycliffe's Version of 1389 and Tyndale's of 1526*, which work was issued in 1865. He died May 27, 1876.

See Vol. IV. p. 70 Am. ed. (p. 79 Edin. ed.).

BOTANY OF NORTH AMERICA. In this article we shall treat of—I. The Geographical Distribution of North American Plants; II. Their Economic Relations; III. American Botanists and Botanical Literature.

I. *Geographical Distribution of North American Plants.*

North America has, among flowering plants, a preponderance of exogens—*i. e.*, plants which have (1) two seed-leaves to the embryo; (2) leaves with veins forming meshes by the union of their ultimate divisions; and (3) a new ring of wood formed each year outside of that made the previous season if the plant be of several years' duration. The endogens (*i. e.* plants with but one seed-leaf to the embryo, with leaves not net-veined, and with no annual rings of wood) are, in the region between the St. Lawrence and the Potomac rivers and east of the Mississippi, to the exogens in the numerical ratio of 27 to 100, and from the Potomac south to the Gulf and east of the Mississippi as 25 to 100. In California the endogens are to the exogens about as 21 to 100; in Nevada and Utah, as 17 to 100; in Colorado, as 20 to 100; and in Alaska, as 26 to 100.

These estimates are to be regarded as approximate only, but they are sufficiently exact to lead to the conviction that as endogens diminish in number of *species* proportionately to the exogens in drier regions, so we may regard the class of endogens as likely to reach its highest general or local specific development in the moister portions of the continent; and this generalization is supported by other facts. But, on the other hand, a single species, if enormously or even preponderatingly rich in the number of its individuals, may so give character to the landscape as to dwarf all other species by comparison. Hence it is that, in spite of the number of species of palms being small within the limits of North America, we have come to consider the palm-element in our moister sub-tropical flora almost to the exclusion of every other, simply from the increase in the number of individuals of a very few species.

Within the limits of the continent one finds, going south, a most notable increase in the number of species of ferns, as well as an increase in size and in the number of the individuals. North of the Arctic Circle there is a remarkable similarity of flora clear around the globe; but as we go south, however, a diversity at once appears, which increases as we approach the equator, whether we compare our continent with the Old World under similar latitudes, or whether we compare one coast of America with the other. North of latitude 40° the most important feature of the vegetation is the coniferous growth. It is entitled to this distinction not only by the number of its individuals, but by their size and by their importance to mankind.

The conifers of the northern belt differ on each side of the continent. On the western side one finds magnificent representatives of tree-forms in the same latitude as he finds the forests of the eastern reduced to undergrowth or to dwarfed shrubs.

The most northern limit of timber is for the Pacific coast 66° 44′ north lat., and for the Atlantic only about 60°. This difference of nearly seven degrees in favor of the Pacific is doubtless in great part due to the Japan Current, which is in the Pacific the analogue of the Gulf Stream in the Atlantic. It is also due in part to the fact that a large percentage of the winds which sweep that coast come from the south and south-west, and hence tend to elevate and equalize the temperature. In this far northern region of America, Oaks and Hickories are strikingly wanting, but Birches and Cottonwood (Poplars) and Willows serve (after the cone-bearing trees) to make up the greater part of the arborescent vegetation. The herbaceous flora has one feature in common on both sides of the continent—it is largely composed of Sedges and Grasses.

Coming south to the northern boundary of the United States, the contrast between the vegetation of the Atlantic and Pacific coasts is much more marked. Indeed, we are almost justified in the assertion that when the present flora was developing the great plain east of the Rocky Mountains was submerged, and that all communication for plants between the eastern and western sides was cut off; that, starting from a common northern base, a tongue of land projected south on each oceanic slope; and that these tongues were colonized by similar plants, which then and there began to develop the peculiarities of the eastern and western coast floras. How marked these are will appear by the following extract taken from Prof. Gray's paper on "Forest Geography and Archæology:"

> "The Pacific coast has no Magnolias, no Tulip tree, no Papaw, no Linden or Basswood, and it is very poor in Maples; no Locust trees—neither Flowering Locust nor Honey Locust—nor any leguminous tree; no Cherry large enough for a timber tree like our wild Black Cherry; no Gum trees (Nyssa nor Liquidambar), nor Sorrel tree, nor Kalmia; no Persimmon or Bumelia; not a Holly; only one Ash that may be called a timber tree; no Catalpa or Sassafras; not a single Elm nor Hackberry; not a Mulberry, nor Planer tree, nor Maclura; not a Hickory, nor a Beech, nor a true Chestnut, nor a Hornbeam; barely one Birch tree, and that only far north, where the differences are less striking. But as to coniferous trees, the only missing type is our Bald Cypress, the so-called Cypress of our southern swamps, and that deficiency is made up by other things. But as to ordinary trees, if you ask what takes the place in Oregon and California of all these missing kinds which are familiar on our side of the continent, I must answer nothing, or nearly nothing. Nor in any of the genera common to the two does the Pacific forest equal the Atlantic in species. It has not half as many Maples, nor Ashes, nor Poplars, nor Walnuts, nor Birches, and those it has are of smaller size and inferior quality; it has not half as many Oaks, and these and the Ashes are of so inferior economical value that, as we are told, a passable wagon-wheel cannot be made of California wood nor a really good one in Oregon. The Atlantic forest has 155 species, and the Pacific but 78 species, which attain the size of timber trees." The herbaceous vegetation would show differences quite as marked.

Toward the Mexican boundary it is apparent that quite another floral element is introduced. There are so many forms present which resemble those whose centre of greatest development is on the Mexican plateau, or even on the lower Mexican levels, that we can hardly avoid concluding that what is now the domain of the United States west of the Mississippi River in lower latitudes has received its most notable botanical accessions from the southward, the striking exception to this statement being found in a small number of species growing in southern alpine or sub-alpine heights, but which show resemblance to, or are actually identical with, species common to the north.

Making, as Prof. Gray has done, a careful comparison of the herbaceous vegetation across the continent in the domain of the United States, three regions might be more or less clearly defined: first, the Atlantic region, extending westward to the great plains; second, the Rocky Mountain region; third, the Pacific region, including the California Sierras and all the land to the west of them. Such a comparison would show that the Atlantic region is richest in plant forms, having 155 orders or order-like groups to 88 in the Rocky Mountain region and to 112 in the Pacific region. Yet the Atlantic herbaceous flora is by no means so showy as that of the Pacific slope, where such striking genera as *Gilia*, *Phacelia*, *Nemophila*, *Pentstemon*, *Mimulus*, and *Lupinus* predominate.

Making our comparison through the same regions, but confining it to the alpine summits mainly above the timber-line (11,300 to 11,800 feet), between latitudes 37° and 41°, we should again find, as Prof. Gray has found, the Atlantic alpine species only 52 in number. The small number is accounted for by the small area which attains the requisite elevation on the eastern slope of the continent. Of the 52 species, 44 are common arctic forms; also of the 52, 23 are common to the alpine summits of each of the three regions; and of these, 21 forms are arctic plants. In the entire number there is not a single genus peculiar to the region. The alpine region of the Rocky Mountains (including all ranges west to the Sierras) shows 184 species, of which 106 are arctic; and that of the Pacific 111, of which 61 are arctic; and there are but nine genera peculiar to the two regions. The arctic flora being, as before stated, very similar in character around the globe, it follows that these alpine arctic plants have also this cosmopolitan character.

Thus far, we have considered neither the forest growth nor the flora of the open desert regions, or semi-desert regions, of this continent. The forest growth will be treated under the head of FORESTRY. A large part of North America comes fairly under the designation of open or desert region, even if we do not consider the prairies proper. The desert condition is not entirely caused by absence of water, for in some instances extreme cold leads to the same destitution of timber and meagre growth of herbaceous vegetation. Often-repeated fires and the struggle between seeds for the same soil lead inevitably to the same result. As it was found that soft-tissued endogens were characteristic of moister regions, so also it appears that exogens more or less contracted in form and hard in tissue are predominant in the arid open grounds. The

"Great American Plains," the interior region of which Salt Lake is the centre, with large parts of Arizona, Texas, and New Mexico, are arid, and consequently destitute of trees.

Nothing can show the monotony of the flora in very high latitudes more clearly than the statement that all Alaska, with its 570,000 square miles, has only half the number of species of flowering plants that Chester county, Pennsylvania, has with but 738 square miles.

The interior arid areas south of British America are almost as uniform in the character of their vegetation, for only a few species, comparatively, predominate, and between all these there is a general resemblance. Several species of Sagebrush are common. Of these, *Artemisia tridentata* is probably most abundant. Associated with it are various Chenopodiaceous plants, recognized popularly under the name of Greasewood; for example, *Sarcobates vermiculatus*, Torr., *Atriplex patula* and *A. canescens*, James. The so-called Winter-fat or White sage (*Eurotia lanata*, Moq.), so valuable as a winter forage for stock running at large, may be fairly regarded as characteristic of these dry regions. *Bigelovia graveolens* is also among the most common plants. Mr. Watson has enumerated 49 species as characterizing the *alkaline desert* flora along the 40th parallel of latitude in Nevada and Utah, whilst the *simple desert* flora has 305 species in the same area. Cottonwoods (*Populus*) of three or four species appear along the streams (and even extend high up into the mountains occasionally), furnishing perhaps the only available timber which has any value whatever in the arts.

South of the 39th parallel a new plant-type becomes common, and even predominant, in the flora. The *Cactaceæ*, which are not absolutely wanting in the region farther north, increase in size and in numbers of both individuals and species, attaining to the dignity of trees 20 to 50 feet high, and giving a distinguishing character to the landscape as the Mexican boundary is approached. Associated with these are Agaves, Yuccas, and Dasylirions (Bear-grass). Among the shrubby growth one finds the Creosote-bush, which is covered with an odorous exudation giving all the chemical reactions of cochineal. *Koeberlinia spinosa*, a shrub covered with long sharp spines, and *Canotia holacantha*, a tree 20 feet high, are both absolutely destitute of leaves, and show to what extent nature limits the surfaces of plants in the interest of a diminished evaporation, in countries where all water-waste must be prevented.

The plains to the east of the Rocky Mountains are almost as desolate as the areas described by Mr. Watson. They are, however, more or less thickly covered with the nutritious, turf-forming grasses upon which the immense herds of buffalo so long subsisted. These open areas within the United States owe their meagre vegetation to the absence of water. High mountains to the east and west, or to the west only, intercept the vapor-laden winds and wring from them almost the last drop of moisture, so that the valleys and plains are absolutely rainless during a large portion of the year. This absence of aqueous vapor in the atmosphere produces a region of great diurnal range of temperature. It is not unusual to find during the summer months—for example, in Colorado—the thermometer standing at 85° Fahr. at noonday and at 32° the following morning. No aqueous vapor is present to prevent the radiation of the earth's heat back into space at night. Only plants, then, capable of enduring such drought and such extremes of temperature during the growing season could live there.

In comparing the vegetation of the eastern side of the continent with that of the western, and these again with that of Mantchuria and Japan, Prof. Gray clearly brought out the fact that our Atlantic flora is more closely related to that of Eastern Asia than to that of our own Pacific coast. Evidence is not wanting which suggests clearly enough a former close connection in high latitudes between the two continents, and probably a former greater similarity in their vegetation. Certainly, the common origin of the plants of Eastern America and North-eastern Asia is established. The presence of such plants as *Sedum Rhodiola*, which is a well-marked boreal species, as far south as Roan Mountain in North Carolina, is one of the many facts which is most readily explained by supposing that the advancing ice-mass of the Glacial Period drove a northern vegetation ahead of it toward the south. When the ice receded toward the north, an elevation of the temperature destroyed all such sub-arctic plants as were unable to find congenial surroundings on the mountain-tops of the south.

Taking North America as a whole, it is characterized by its Asters, Golden-rods, and Cacti, by its gigantic Conifers, and by the number of species among its deciduous-leaved trees. The number of species of Hawkweed (*Hieracium*), and the areas of Heather (*Calluna vulgaris*) which characterize vast portions of Northern Europe in like climatic conditions, have a strikingly small representation here.

Mr. Watson's *Index of North American Botany* (1878) enumerates 2775 species of indigenous flowering plants north of Mexico. Taking the number given by Mr. Watson's work, so far as it is completed, and comparing it with like portions of various other American floras, we may safely assert that America north of Mexico contains about ten thousand indigenous species of plants; to which if we were to add another thousand for the constantly increasing number of naturalized plants, we should have an aggregate of 11,000 species. Mexico is rich in specific forms, and is as yet too little known to allow of even an approximate estimate as to the number of species it contains. Drs. Parry and Palmer, collecting in one of the best-known portions of Mexico in 1878, found that one-tenth of the plants obtained by them were new to botanists.

Of ferns we have now known and described in North America north of Mexico about 150 species.

II. *Economic Relations of North American Plants.*

Of organic materia medica, by far the greater part comes from the vegetable kingdom, and among the plants by which the American physician strives to prevent or to arrest disease, the larger portion are either native here or may be cultivated here. It is further remarkable that nearly every class of remedy is represented in our indigenous flora. It is true that we have no sleep-producer equal to opium, and no remedy against malarial poisoning equal to Cinchona and its various derivatives; neither do we have any immediate prospect that they will be produced on North American soil. But there are indigenous plants which to a certain extent have in the past taken their places. Among the more important native remedies we may enumerate *Veratrum viride*, or White Hellebore; *Gelsemium sempervirens*, or Yellow Jessamine; *Grindelia robusta*, or Gum-plant. The various species of Gentians may almost without exception be used as bitter tonics. It is more than probable that within a few years the improved methods of pharmacy and the active physiological investigations now being prosecuted will bring to light from our South-west many valuable drugs.

We can yet hardly venture to place a limit to the possibilities of our plants in the production of fibres to be used in textile fabrics. The present difficulty lies not in want of the proper fibre, but in want of machinery to isolate it—a difficulty almost sure to be overcome as our necessities become greater. Thus, the Mallow family furnishes a number of species with bast fibres of good quality, and which actually grow as weeds, some of which are even difficult to eradicate. Such a species is the Velvet Leaf (*Abutilon Avicennæ*). The Yuccas and Agaves of the South-western desert-areas furnish an abundance of coarse fibre, which is manufactured into cordage and mats. The Yucca also, as well as the wood of the American Aspen (*Populus trem-*

uloides), is made into a pulp and then into paper. The solid, close wood of some species of *Pirus* has been used for box in the engraver's art, and it is probable that even a better substitute will be found. So far as density of substance is concerned, the American flora furnishes wood of all grades between the light, soft Pumpkin Pine (*Abies subalpina*) and the dense Mountain Mahogany (*Cercocarpus ledifolius*), which alone of our woods is heavier than water.

In the list of food-plants America has furnished the *Zea Mays*, or Indian corn, to the Old World, and also the common Potato, which is found indigenous and wild as far north as the mountains of Arizona. To the miserable native population of Arizona, New Mexico, and California the seeds of the Piñon Pine (*Pinus edulis* and *P. monophylla*) furnished a never-failing source of food; and so did the still smaller starchy seeds of the various species of *Atriplex*. *Salvia columbariæ* (a blue Sage) was commonly cultivated as a crop by both the old Nahua races of Mexico and by the early inhabitants of California. To the former it was one of the regular sources of revenue furnished to the government, and by both the seeds, when ground into a meal (much resembling flaxseed meal), were known as *pinoli*.

Coontie (*Zamia integrifolia*), a native of Florida, furnishes the Florida arrow-root. Under the name Mescal two species of plants (*Agave Palmeri* and *A. Parryi*) are known and utilized in the Arizona region in the production of the well-known mescal whiskey. The unopened interior leaves of the same plants form a kind of head which when roasted under ground for several hours yields a sweet, nutritious, though somewhat laxative food, which has long been popular among both whites and Indians. Indian Rice or Water Oats (*Zizania aquatica*) grows wild and abundantly in the streams tributary to lakes in our North-western States (especially about Lakes Michigan and Superior). It furnished an important article of food to the aborigines. In early times almost the only sugar used in the Atlantic Eastern and Middle States was produced in the forests of the country from the sap of the Sugar-maple tree (*Acer saccharinum*). Tobacco furnishes one of the most valuable crops in the United States.

The list of forage-plants which are indigenous, and which grow abundantly enough to form important factors of practical botany and agricultural economy, is very long. Not less than 40 species of grass whose value as forage has been tested are native to the country. Of these, the so-called Bunch-grasses of the Western mountain-parks; the diœcious Buffalo-grass (*Buchloë dactyloides*); the *Munroa squarrosa*, another somewhat similar grass peculiar to the great plains, along with the "Grama" grasses (*Bouteloua*), *Pleuraphis Jamesi*, and *Vaseya comata* of the drier South-western open grounds, —all are of great value in the regions specified. Most of them are abundant enough to support perpetually, during half the year at least, enormous herds on land which is valueless for any other purpose. The Sedges (*Carex*, etc.), whose value as forage-plants was so long overlooked, are beginning to have a proper value placed upon them. In some portions of the continent they furnish abundant forage when the Grasses proper are scarce and innutritious. (See also CEREALS (in AGRICULTURE) and FORESTRY.)

III. *American Botanists and American Botanical Literature.*

Perhaps the earliest volume devoted to American plants is a quarto printed at Paris in 1635, entitled *Canadensium Plantarum aliarumque nondum editarum Historia*, by Jac. Cornutus. Josselyn's *New England Rarities* (1672) treats partly of plants, but chiefly shows the credulity of its author. In 1680, Bannister sent to Ray in England a catalogue of plants observed by him in Virginia. In 1730, American botany properly begins, when John Bartram began to collect plants for European correspondents, and especially for Peter Collinson of London. In 1732 the first volume of Mark Catesby's *Natural History of Carolina, Florida, and the Bahamas* appeared; the second followed in 1743. John Clayton of Virginia, an industrious botanist for his day, furnished descriptions and plants to Gronovius in Holland. From them the latter commenced the publication of what Darlington calls the first systematic enumeration of North American plants, under the title of *Flora Virginica*. Dr. John Mitchell sent about 1740 to Peter Collinson a "Paper in which thirty new genera of Virginia plants were proposed." Peter Kalm, a Swede and pupil of Linnæus, published his *Travels in North America*. Many less important papers were contributed to the Royal Swedish Academy of Natural Sciences by the same author. Dr. Adam Kuhn of Philadelphia, a favorite pupil of Linnæus, was the first professor of botany in America, being appointed in 1768, but accomplished little for science. In 1785, Manasseh Cutler published the first essay upon the plants of New England. The period of American independence in botanical matters began with Humphrey Marshall's *Arbustum Americanum* (1785). This work treated of American plants, was written by an American author, and was printed in America. It is still intrinsically interesting and valuable. Schoepf at Erlangen in Germany in 1787, B. S. Barton in 1798, and Jacob Bigelow of Boston each made contributions to American materia medica. Walter's *Flora Caroliniana* appeared in London in 1788. William Bartram published his *Travels in the Carolinas, Georgia, and Florida in 1791*. With the first of this century the American Philosophical Society of Philadelphia began issuing botanical contributions from B. S. Barton, Muhlenberg, Palisot de Beauvois, and later from De Schweinitz and Nuttall. In 1801 the *Oaks of North America*, and in 1803 the *Flora Boreali-Americana*, were published by André Michaux, the latter, however, edited by Claude Richard. B. S. Barton published the first elementary work on botany in 1803.

The celebrated expedition of Lewis and Clarke started across the American continent in 1803, and, though most of the collections were unfortunately lost, it aroused a spirit of discovery which will know no rest until the whole of the continent has been explored and its animal, vegetable, and mineral productions made known. In 1810, F. André Michaux published at Paris a magnificent work entitled *Histoire des Arbres Forestiers de l'Amérique Septentrionale*, which was illustrated with superbly colored plates. Of this an English translation appeared in 1817 under the title of *North American Sylva*. Muhlenberg published his *Catalogue of Known Native and Naturalized Plants* at Lancaster, Pa., in 1813. The year 1814 gave us Pursh's *Flora Americæ Septentrionalis*, published in London in 2 vols., and *Florula Bostoniensis*, by Dr. Jacob Bigelow, both valuable works. 1816 witnessed the commencement by Stephen Elliott of his *Sketch of the Botany of South Carolina and Georgia*. A posthumous work by Muhlenberg upon the *Grasses and Cyperaceous Plants of North America* appeared in 1817. In 1818, Nuttall published an important treatise on *Genera of North American Plants*, with descriptions of less known species, and in the same year the *Philadelphia Flora* was published by Dr. W. P. C. Barton. Amos Eaton's *Manual of Botany* (1st ed. 1818; 8th ed. 1840) was the earliest work of the kind which the country produced, and was fairly demanded by the increasing taste for this science, which appeared to grow out of the very obstacles to its successful study. Torrey commenced his *Flora of the Northern and Middle Sections of the United States* in 1824, and in 1826 published a *Compendium of the Flora of the Northern and Middle States*. Darlington's *Florula Cestrica* appeared in the same year. Schweinitz, who in 1824 was associated with Torrey in *A Monograph of the North American Carices*, was also author of a paper upon the fungi of this continent, the earliest American contribution to cryptogamic botany. Nuttall in 1827 gave to the country his *Introduction to Systematic and Physiological Botany*. *Flora Boreali-*

Americana, or the Botany of the Northern Parts of British America, one of the most important botanical publications of this century, was commenced in 1829 and completed in 1840, making one large quarto volume of text and another of 238 quarto plates. It was largely based upon collections of plants made by British explorers. Up to this time most of our botanical literature was foreign; many of the plants growing upon the remoter parts of this continent were first gathered by foreign collectors for foreign herbaria, and often the refuse was returned to this country as exchanges for other American plants. But complete botanical independence has since been ensured. Dr. Beck gave us in 1833 his small volume, *Botany of the Northern and Middle United States*, arranged upon the natural method of Jussieu. Torrey and Gray began in 1838 to publish their *Flora of North America*, a work which in its minuteness of detail and in its critical character surpassed all that had been done previously for the botany of the country. The first volume, through the *Polypetalæ*, was completed in 1840. The second, which finished what was then known of the *Monopetalæ* through the *Compositæ*, was printed later, and with it the work ended, as the botanical exploration was being pushed so rapidly that the book would have been antiquated before it was completed. Dr. Torrey's connection with this great undertaking may be said to have ended when the second part appeared, though he still labored in describing and classifying our flora. In 1878, Prof. Gray published his *Synoptical Flora* of North America, which may be regarded as extending the above-named book through the *Monopetalæ*. The author is now (1883) engaged in revising the work hitherto done on the *Compositæ*. This, when complete, will form a companion volume to the *Synoptical Flora*. Both these may be regarded as the most exact and critical labor of his active and useful life. In 1834, Prof. Gray published a monograph of *North American Rhynchosporæ*, and two volumes of *Labelled Specimens of American Gramineæ* and *Cyperaceæ*. Gray's *Elements of Botany* and Torrey's *Monograph of our Cyperaceæ* appeared in 1836. Darlington's *Flora Cestrica* (1837) was originally arranged on the artificial system, but the edition of 1853 was arranged according to the natural method. Dr. Engelmann printed in 1842 his *Monograph of the North American Cuscutinæ*, and the same year Gray's *Botanical Text-Book* appeared, which has since gone through several editions. The State of New York in 1843 published two superb volumes, prepared by Dr. Torrey and copiously illustrated, upon the plants within the limits of that State. Fremont in the same year began his prolific explorations. The most important contributions of 1845 were an enumeration by Engelmann and Gray of Lindheimer's *Texan Plants*, and a *Class-Book of Botany*, by Alphonso Wood. In 1846, Gray and Sullivant issued a small work on the *Mosses of the Alleghanies*, and George B. Emerson a very valuable volume on the *Trees and Shrubs growing Naturally in the Forests of Massachusetts*. Cambridge in Massachusetts in 1848 produced three important volumes: 1st, *Synopsis of the Lichens of New England, the Other American States, and British America*, by Edward Tuckerman; 2d, Gray's *Manual of Botany;* and 3d, by the same author, the first volume of a projected series entitled *Genera Floræ Americæ Boreali-orientalis, Illustrata*. Though intended to include ten volumes, the series ended with the second. The labors of Francis Boott on the genus *Carex* culminated in the production of four ponderous illustrated volumes which will ever remain as a monument to his industry and liberality. The *Botany of the Mexican Boundary Survey* (1858) was a work of great importance, especially as it contained Engelmann's contribution upon that hitherto little understood order, the *Cactaceæ*. The active explorations undertaken by the Government now began to produce one valuable report after another upon the vegetable treasures of our Western domain. Fendler, Wright, Parry, and Thurber sent home from the extreme South-west collections, each of which gave birth to important memoirs, mostly from the pens of Torrey, Gray, and Engelmann. Chapman's *Flora of the Southern United States* appeared in 1860, and Sullivant's beautiful *Icones Muscorum* in 1864. Before this, in 1859, Dr. Gray had prepared his important paper upon the relation of the Japanese flora to that of North America. In 1868, Josiah Hoopes' *Book of Evergreens* appeared, and it remains to this time a valuable and much quoted authority. The year 1871 brought Mr. Watson into the field with his most valuable volume on the *Botany of the Fortieth Parallel Surveys*, in the preparation of which he was aided by Prof. D. C. Eaton and others. In 1874, Porter and Coulter published from the Hayden surveys a *Synopsis of the Flora of Colorado*, and Rothrock finished, with the assistance of most of the leading botanists of the country, the sixth quarto volume of the Wheeler surveys, in which were described the collections made in Nevada, Utah, Colorado, New Mexico, Arizona, and California, as well as all the Ferns native to the regions west of the 105th degree of W. long. and south of the 40th degree of N. lat., this last portion being from the pen of Prof. D. C. Eaton. The botanical portion of the geological survey of California was finished in 1880 by Messrs. Watson and Brewer, assisted by Gray, Engelmann, Thurber, Bebb, and others. It is an important and lasting contribution to science in the shape of two large octavo volumes. Bessey's *Text-Book of Botany* (1880) directs the attention of coming botanists to vegetable anatomy and physiology.

Among important special works we have Tuckerman's *Genera Lichenum*, published in 1872, and in 1882 part first of his *Synopsis of North American Lichens*. Lesquereux has fully established by his volumes on the Cretaceous and Tertiary flora a place for the science of fossil plants among us. In 1852, Prof. Harvey of Dublin began the publication of his *Nereis Boreali-Americana*, which was completed in 1857. In 1872, Dr. H. C. Wood published his work on *North American Freshwater Algæ*, and in 1881, Prof. Farlow a work upon the *Marine Algæ*. The labors of Curtiss, Ravenel, Ellis, Peck, and Farlow are developing a wide-spread taste for study of the Fungi. Ellis especially by the publication of his *Centuries of North American Fungi* has laid a sure foundation for the study of these plants in future. Representing that always popular branch of botany, the Ferns, there are the fine volumes of Eaton and the smaller but valuable writings of Davenport, Underwood, and Williamson. Meehan and Goodale have prepared popular illustrated volumes upon the American flora which are creditable to the nation, and the authors have added much in more special studies to our knowledge of plant-life. (J. T. R.)

BOTTS, John Minor (1802–1869), a Virginia statesman, was born in Dumfries, Va., Sept. 16, 1802. He studied law, and practised for a few years at Richmond, Va. In 1833 he was elected to the State legislature, and continued to be a member till 1839, when he was elected to Congress. He was a prominent member of the Whig party, and refused to follow the course of his personal friend, President Tyler, in his separation from it, and supported Mr. Clay in 1844. He was one of the few Southern members who sustained the right of petition. After the dissolution of the Whig party he acted with the Native American party. In 1852 he resumed the practice of law at Richmond. He opposed the repeal of the Missouri Compromise in 1854, and the admission of Kansas under the Lecompton Constitution in 1858. In 1861 he exerted himself ineffectually to prevent the secession of Virginia, and throughout the civil war remained faithful to the Union cause. His estate was in the region where the war raged, and for a short time he was imprisoned by the Confederates. After the war he acted as a Republican. In 1869 he published *The Great Rebellion: its Secret History*. He died in Culpeper co., Va., Jan. 7, 1869.

BOUCHER DE CRÈVECŒUR DE PERTHES, JACQUES (1788–1868), a French author noted for his archæological discoveries, was born at Rethel, Ardennes, Sept. 10, 1788. He belonged to an ancient family, and his father was the director of customs at Abbeville and the author of several botanical works. Through his father's influence with Napoleon he was employed on missions to Italy, Austria, and various German states. He commenced his literary career with a tragedy, *Frédégonde*, to which he afterwards added other tragedies, tales, and a comedy. In an anonymous work he advocated free trade. He became president of the Société d'Émulation at Abbeville, and gathered a large collection of pre-historic, Celtic, and Roman antiquities, which he presented to the museum at Saint-Germain-en-Laye. He became widely known by his work *De la Création, essai sur l'Origine et la Progression des êtres* (5 vols., Paris, 1838). In 1841, in a bed of sand near Abbeville, he discovered a flint which he believed to have been a tool, and soon after began an investigation of ancient river-sands, which resulted in the discovery of numerous stone implements. He assigned these tools to an antediluvian period, but this theory was for a time resisted by distinguished geologists. A still warmer controversy arose when he announced his discovery, in March, 1863, of a fossil human jawbone in the cave of Moulin-Quignon. The fact of the discovery is now universally admitted and its value recognized. By it, in connection with his previous work, Boucher de Perthes became the founder of the new science of archæo-geology, or investigation of the traces of primitive man. He gave the fullest account of his discoveries in his *Antiquités celtiques et antédiluviennes*, the first volume of which appeared in 1847 and the third in 1865. His theory as to the age and early condition of the human race is given in his books *De l'Homme antédiluvien et de ses Œuvres* (1860) and *Des Outils de Pierre* (1866). Among his other writings are a dictionary of the passions under the title *Homme et Choses* (4 vols., 1851), *Les Masques, biographies sans nom* (5 vols., 1861–64), several books of travel, and *Sous dix Rois, souvenirs de 1791 à 1860* (8 vols., 1862–67). His last work was *Des Idées innées de la Mémoire et de l'Instinct* (1867). He died at Amiens, Aug. 5, 1868.

BOUCICAULT, DION, an Anglo-American author and actor, is the youngest son of the late S. S. Boucicault, and was born in Dublin Dec. 20, 1822. Educated partly in Dublin and partly at London University, he was intended for an architect. March 4, 1841, a five-act comedy called *London Assurance* was brought out by Boucicault. *London Assurance* has kept the stage for forty years; it is a lively, brisk, highly-colored comic play, made out of old materials, but made so skilfully that it has a vitality of its own. It has always been understood that the young author, then only eighteen, was greatly indebted for suggestions, improvements, and even more elaborate alterations, to the remarkably fine company of comedians by whom the play was acted, and among whom were Charles [James] Mathews, Farren, Mrs. Nesbitt, and Mme. Vestris; and the late John Brougham also left on record his claim to a share in the composition of the comedy. But, after all is said, the chief credit is plainly due to Mr. Boucicault, for he showed his ability to repeat the success. In Feb., 1842, he brought out the *Irish Heiress*, and in Nov., 1844, *Old Heads and Young Hearts*. On June 14, 1852, Mr. Boucicault made his first appearance in London as an actor as the Vampire in his fantastical piece of that name. In 1853 he came to America, producing various plays; among them were a version of the *Louis XI.* of Casimir Delavigne and a drama called *Janet Pride*, taken in part from M. Dennery's *Marie Jeanne*. After another visit to England, Mr. Boucicault came again to this country, with Miss Agnes Robertson, an actress of grace, beauty, and pathetic power, who soon took his name. With her in the chief parts, he brought out in New York in 1857 and the three following years a series of very effective dramas—*Pauvrette* (from the French); *Jessie Brown; or, The Relief of Lucknow*, in which he acted Nana Sahib; *Dot; or, The Cricket on the Hearth* (dramatized from Dickens to enable Mr. Joseph Jefferson to appear as Caleb Plummer); the *Octoroon* (in which he acted the Indian Wah-no-tee); *The Heart of Mid-Lothian* (from Scott); *Vanity Fair* (from Thackeray); *The Streets of New York* (from the French); and *The Colleen Bawn; or, The Brides of Garryowen* (taken mainly from Gerald Griffin's tale *The Collegians*). In *The Colleen Bawn*, Mr. Boucicault acted Myles-na-Coppaleen, and made a terrific plunge head-foremost into the lake to rescue Eily O'Connor, played by Mrs. Boucicault. During part of this time, from September to December, 1859, Mr. Boucicault was part manager of the Winter Garden Theatre in New York, at which he was acting in the *Octoroon*. In September, 1860, Mr. and Mrs. Boucicault returned to England, and for the next four years acted there in the very successful plays already brought out in New York. In Nov., 1864, he produced in Dublin *Arrah-na-Pogue; or, The Wicklow Wedding*, a three-act Irish play akin in style to *The Colleen Bawn*. In Sept., 1865, his version and amplification of the earlier dramas on Washington Irving's *Rip Van Winkle* was acted by Mr. Joseph Jefferson at the Adelphi, London. In London in the next five or six years he produced a series of dramas, chiefly sensational, among which were *The Long Strike*, *The Flying Scud*, *Hunted Down*, *After Dark*, *Formosa*, *Jezebel*, *The Rapparee*; of these *The Flying Scud* (a horse-racing play) and the *Long Strike* (which had a telegraph scene) were the most successful. They marked a great deterioration in Mr. Boucicault's taste, as they appealed to a low type of emotion and a lower type of playgoer; yet even the poorest of them contained clever scenes, bright dialogue, and neat sketches of character. Since 1871, Mr. Boucicault has vibrated between England and the United States. He has produced in England *Kerry* (an adaptation of Mme. de Girardin's *La Joie fait Peur*) and in America *Led Astray* (a skilful version of M. Octave Feuillet's *Tentation*, acted at the Union Square Theatre during most of the season of 1872–73); *Daddy O'Dowd* (an Irish play based on the *Crochets du Père Martin*), and *The Shaughraun* (1874), another Irish play of more originality than most of the others, although the chief part, admirably acted by the author, is in great measure an Irish version of *Rip Van Winkle*. In 1878, Mr. Boucicault again became a manager in New York, having taken Booth's Theatre, where, however, his reign was brief, as the melodrama on which he relied, *Rescued*, failed dismally. In this brief review of Mr. Boucicault's career it has been necessary to pass over numberless plays of his. Nor has there been room to notice at length the letters on Irish politics which Mr. Boucicault published in England while he was acting there in 1876 and 1879 in his own Irish plays, one of which, *Daddy O'Dowd*, he rewrote for the English stage, introducing a political scene which failed to find favor. Nor has mention been made of his collaborations with Mr. Charles Reade in writing the novel *Foul Play* (rival dramatizations of which were made by each author), and with Mr. H. J. Byron in writing a sensational melodrama called *Lost at Sea*. Mr. Brougham, as has been said, claimed a share in *London Assurance*, and Benjamin Webster asserted a joint-authorship of *Janet Pride*. Mr. Boucicault's dramatic work divides itself easily into three classes—the earlier five-act comedies, the sensational dramas largely taken from the French, and the Irish plays. It cannot be doubted that the best that Mr. Boucicault can do is to be seen in the charming pictures of Irish life and scenery. *The Colleen Bawn*, *Arrah-na-Pogue*, and *The Shaughraun* are delightful dramas, pure in tone, touched with a tender sentiment, full of fun and gayety, and rich in scenes of moving interest. They have more heart than the earlier comedies; and, while less pretentious, are of higher literary value. (J. B. M.)

BOUGHTON, George H., an artist of English birth, who is sometimes classed among the American painters. He was born in Norfolk, England, in 1834. In 1837 his parents removed to Albany, N. Y., and in that city his first artistic essays were made. In 1853 he went to London for purposes of study. He was very successful both with portrait and composition pictures, and in 1853 one of the latter was purchased by the Art Union. He did not make a long stay in England, and on his return to America he first went to Albany, but afterwards opened a studio in New York, where in 1858 he first exhibited at the National Academy, his picture of that year being entitled Winter Twilight. In 1859, Boughton went to Paris, where he studied for two years, and in 1861 he returned to London, where he has since resided. Boughton has been a frequent and popular contributor to the principal English and American exhibitions, and at the Centennial Exhibition of 1876 in Philadelphia examples of his works were shown both in the English and the American sections of the art department. He has also contributed to the Paris exhibitions. Of the most noted works of this artist may be mentioned Passing into the Shade, Hop-Pickers Returning, Twilight, A Breton Haymaker, Wayside Devotion in Brittany, The Early Puritans of New England, A Breton Pastoral, The March of Miles Standish, The Age of Gallantry, A Chapter from *Pamela*, The Heir, The Canterbury Pilgrims, The Waning of the Honeymoon, and The Return of the Mayflower. Many of Boughton's paintings have been engraved, and those rendering incidents in the lives of the Puritan settlers in New England especially have had great popularity. He is a genuine humorist, and within certain well-defined limitations a true poet. His compositions are usually simple, and the simpler they are the better they are apt to be, for he is not skilful in managing a considerable number of figures. (W. J. C., JR.)

BOUGUEREAU, Adolphe William, a French artist, was born at La Rochelle, Nov. 30, 1825. He was placed by his parents in a business-house in Bordeaux, but was permitted to visit the drawing-school of M. Alaux, in which he gained the annual prize. This success decided him to devote himself to art. As he was without means, he went to Saintonge to reside with an uncle, who was a priest, and here he painted a great number of portraits, with the proceeds of the sale of which he was able to go to Paris, where he placed himself under the instruction of Picot. Afterwards he entered the École des Beaux-Arts, where in 1850 he gained the *prix de Rome*, which enabled him to reside in Italy for several years. In 1854 he exhibited The Body of St. Cecilia borne to the Catacombs, a work which immediately gave him a reputation. This picture was purchased by the Government for the Luxembourg collection. Shortly after he was employed by M. Bartolony to decorate his drawing-room, and he was so successful with this work that the decorations of the Hôtel Perière were entrusted to him. Bouguereau has painted an immense number of pictures, many of which contain life-size figures, of which may be mentioned Philomela and Procne and La Vierge Consolatrice—both of which were acquired by the Government—Youth and Love, Orestes Pursued by the Furies, Pieta, The Virgin, Jesus and John, Flora and Zephyr, A Bather, Charity, Homer, Nymphs and Satyrs, The Little Marauders, Harvest-Time, The Mower, The Vow of St. Anne, Blowing Bubbles, On the Way to the Bath, Rest during the Harvest, A Girl with a Tambourine, and Maternal Solicitude. The Orestes was purchased by the late Joseph Harrison, Jr., of Philadelphia, and was presented by his widow to the Pennsylvania Academy of the Fine Arts. It is Bouguereau's most important work in the line which it represents, but, while it has many and great merits, it is scarcely so interesting as the less ambitious performances of this artist. The same may be said of Bouguereau's religious pictures. There is a certain hardness in the outlines of this artist and a certain waxiness in his flesh-textures which are not to be commended, but his mothers and their babies, his barefoot children engaged in various childish occupations, and the like, are always charming. Bouguereau is one of the most popular of the French painters of to-day, and his works are eagerly purchased at large prices, especially by American collectors. (W. J. C., JR.)

BOULANGER, Gustave-Rodolphe-Clarence, a French artist, was born at Paris, April 25, 1824. He studied under Delaroche and Jollivet, and afterwards went to Italy, where he remained until 1856. Among his most celebrated pictures are St. Sebastian and the Emperor Maximilian, Hercules, a Summer Bath at Pompeii, Roman Comedians reciting their *Rôles*, Le Gynécée, The Appian Way in the Time of Augustus, and A Repast at the House of Lucullus. Boulanger also executed the decorative paintings for the *foyer de la danse* of the new opera-house at Paris. Boulanger is an able artist, but he has neither the great archæological learning nor the high technical skill of Gérôme, while he is lacking both in the humor and the dramatic power of that artist. He is fond of painting the undraped human figure, but his nudities seem to exist merely for the sake of nudity. Many of Boulanger's works have been reproduced by engraving and photography, and they enjoy considerable popularity. He has been decorated with the cross of the Legion of Honor.

BOULDER, the county-seat of Boulder co., Col., is on Boulder Creek and on the Boulder Valley and Colorado division of the Union Pacific Railroad. It is at the eastern base of the Rocky Mountains, 25 miles N. W. of Denver, near extensive coal fields as well as gold- and silver-mines. It has two banks, four churches, fine public schools, three weekly newspapers, and is the seat of Colorado State University. Boulder Creek furnishes abundant water-power, and has numerous saw-mills, flour-mills, and smelting and reduction works along its banks. Boulder is furnished with water brought from the mountains in iron pipes. Population, 3069.

BOUSSINGAULT, Jean Baptiste Joseph Dieudonné, a French chemist, was born at Paris, Feb. 2, 1802, and educated at the mining school of St. Étienne. He was afterwards employed by an English company to direct the working of some mines in South America. He made use of the opportunity to observe the phenomena of nature in the tropics, his reports upon which gave him a scientific reputation and brought him to the notice of Humboldt, then exploring the New World, who afterwards became his close friend. The insurrection of the Spanish colonies put an end to the mining enterprise, and Boussingault became attached to the staff of Gen. Simon Bolivar with the rank of colonel. His position was, however, rather that of a savant than of a soldier, and he explored Ecuador and all the region between Carthagena and the mouth of the Orinoco, as well as Peru and Bolivia. He made many observations in meteorology and important collections in botany and mineralogy. Soon after his return to France he was made professor of chemistry at Lyons, and shortly afterwards dean of the college there. In 1839 he was elected a member of the Academy of Sciences, and went to Paris, where he became professor of agriculture in the Conservatory of Arts and Trades. In 1848 he was elected to the Constituent Assembly, and became a member of the Council of State. He was made commander of the Legion of Honor March 14, 1857. Agricultural chemistry owes much to his labors. He is author of many memoirs published in the *Annales de Physique et de Chimie*, the *Compte Rendus de l'Académie des Sciences*, etc. Several of these have been published in a volume entitled *Mémoires de Chimie agricole et de physiologie* (Paris, 1854). He also published an excellent *Traité d'Economie rurale* (1844), afterwards enlarged under the titles *Agronomie, Chimie agricole et physiologie* (5 vols., 1860–74), and *Études sur la Transformation du Fer en Acier* (1875).

BOUTWELL, George Sewall, LL.D., an American statesman, was born at Brookline, Mass., Jan. 28, 1818. In 1820 his parents removed to Lunenburg, Mass., where for forty years his father was a leading citizen. He received a public-school education, and at the age of thirteen was employed in a country store. At seventeen, removing to Groton, Mass., where he has since resided, he began to teach school. In 1836 he commenced the study of law, and two years later was made clerk in a court. In 1842 he was elected to the State legislature, where he soon became the leader of the Democratic party. Except in the years 1845 and 1846 he continued to be a member of that body until 1851, when he was elected governor of Massachusetts by a coalition of the Democrats and Free-Soilers. He was re-elected in the following year, and in 1853 he, as well as his father, was a member of the constitutional convention. Mr. Boutwell prepared the draft of the constitution that was submitted to the people. From 1850 to 1855 he was a member of the State board of education, and from 1855 to 1861 was its secretary. Each year he prepared elaborate reports; in 1858 he published a volume on *Educational Topics and Institutions*, and in 1860 a *Digest of the Laws of the State relating to Schools and Eleemosynary Institutions*. Upon the repeal of the Missouri Compromise in 1854 he assisted in forming the Republican party, and in 1860 was a delegate to the Republican convention at Chicago which nominated Abraham Lincoln for the Presidency. In February, 1861, he attended the Peace Conference called by Virginia, and held at Washington, in the vain hope of averting the war. In 1862, when the enormous expenses of the civil war compelled a resort to direct taxation, Mr. Boutwell was appointed by President Lincoln commissioner of the new department of internal revenue, and organized the system which with few modifications has since continued in force. He also prepared a *Manual of the United States Direct and Revenue Tax*. From 1863 to 1869 he was a member of Congress, and served on the judiciary committee. During his term of service the Fourteenth and Fifteenth amendments to the Constitution were reported to Congress from this committee, and Mr. Boutwell had charge of the bill for the latter. He was strongly opposed to the reconstruction policy of President Johnson, and was one of the managers appointed to conduct his impeachment before the Senate. In March, 1869, Mr. Boutwell was appointed by President Grant Secretary of the Treasury, and in his first annual report recommended the funding of the national debt. This was accomplished by the act of Congress of July 15, 1870, which he had prepared. During his administration the debt was reduced $364,000,000, and the annual interest from $133,000,000 to $101,000,000. In 1873, Mr. Boutwell was elected to the United States Senate. In 1877 he was appointed by President Hayes to prepare the second edition of the *Revised Statutes of the United States*. A volume of his *Speeches and Papers on the Rebellion* was published in 1868.

BOVIDÆ (Lat. *bos*, gen. *bovis*, an ox), a family of artiodactyle ruminating quadrupeds, the cleft-hoofed, hollow-horned ruminants, characterized by having the horns permanent, common to both sexes, consisting of a corneous sheath enclosing a bony core which is a process of the frontal bone; teeth, *i.* $\frac{0-0}{4-4}$; *c.* $\frac{0-0}{0-0}$; *pm.* and *m.* $\frac{6-6}{6-6}=\frac{12}{20}=32$. This brief expression is diagnostic of the family, which includes cattle, sheep, goats, and true antelopes (not the American ANTELOPE, so called, which see). It is divisible into a number of sub-families, several of which are represented in North America, each one by a single genus and species in the present geological epoch. These are: *Bovinæ*, represented by the buffalo, *Bison Americanus*; *Ovibovinæ*, by the musk-ox, *Ovibos moschatus*; *Ovinæ*, by the Rocky Mountain sheep, or big-horn, *Ovis montana*; and *Antilopinæ*, by the Rocky Mountain goat, so called, *Aplocerus montanus*, which is a true antelope and closely related to the chamois of Europe. (E. C.)

BOWDITCH, Nathaniel Ingersoll (1805–1861), son of the eminent mathematician Nathaniel Bowditch, was born at Salem, Mass., June 17, 1805. He entered Harvard University at thirteen, but before the end of the year was suspended for some months, and, as he afterwards acknowledged, this discipline was highly beneficial to himself. He graduated with distinction in 1822, studied law, was admitted to the Boston bar in 1825, and became the most eminent conveyancer in that city, being noted for his accuracy and industry. He wrote a memoir of his father which was prefixed to his translation of Laplace's *Mécanique Céleste*, published in 1839. In 1857 he published a *History of the Massachusetts General Hospital*, a work of permanent value. He made a classified collection of curious local names, which he published under the title *Suffolk Surnames* (3d ed. 1861). In 1860 he gave to Harvard College $70,000 as a foundation for sixteen scholarships, and bequeathed to it $2000 for the purchase of books. He died at Boston, April 16, 1861.

BOWDOIN COLLEGE, the oldest college in Maine, is situated in Brunswick, Cumberland co. Before the war of the Revolution a project was started for establishing a college in the District of Maine, but on account of the threatening aspect of public affairs it was abandoned. The scheme was revived in 1788, and after delays caused by disagreement as to its name and location, an act was passed by the legislature of Massachusetts in 1794 incorporating Bowdoin College in Brunswick, the name being given in memory of Gov. James Bowdoin, and the location being central for the District. The administration of the college was vested in thirteen trustees and forty-five overseers, the latter having a negative on the former. The college having received his family name, James Bowdoin, Esq., of Boston, son of the governor and afterwards minister to the Spanish court, gave lands and money for its endowment amounting to nearly $7000. It was not until Sept., 1802, that the college was opened for its work. A building of brick of three stories had been erected.

The first president, Rev. Joseph McKeen (Dartmouth, 1774), from Beverly, Mass., and the first professor, John Abbot, Esq. (Harvard, 1784), from Portland, whose department was Latin and Greek, were inducted into office with due ceremonial, and eight students were admitted.

Dr. McKeen, by his commanding presence, genial temper, his learning, and scientific tastes and acquirements, by the repute he brought with him and his strength of character, was well fitted for his position. After his death, in 1807, Rev. Jesse Appleton (Dartmouth, 1792) succeeded, and his administration of twelve years was marked by eminent ability.

In 1812, by a bequest of Mr. Bowdoin, his private library, rich in works of science, of English, French, and Spanish literature, and a valuable collection of paintings, came to the college. From the same source valuable scientific collections were received, and Dr. G. C. Shattuck a few years after presented an extensive cabinet of shells. By these donations a fresh impulse was given to scientific studies. Dr. Appleton died Nov. 12, 1819, exhausted by his unremitting labors and devotion to study. Rev. William Allen (Harvard, 1802), who had been president of Dartmouth University during its brief existence, was elected to succeed him, and was inducted into office May, 1820.

The erection of the District of Maine into an independent State that year had an important bearing on the interests of the college. The "act of separation" from Massachusetts had stipulated that the annual grant of $3000 to the college for ten years should be continued by the new State till the expiration of that period. This condition was observed, but the constitution of Maine prohibited the legislature from making a grant to any literary institution unless the legislature should have a certain right of control in its affairs. This feature of that instrument being regarded as the offspring of political jealousy and management, such right of control was yielded by the boards of the college with reluctance, the reasons for which in a few years proved to be well founded. The legislature proceeded at once to increase the number of the boards by appointment of the governor and council—that of the trustees to twenty-five and of the overseers to sixty-five. The new relations of the college to the State opened with flattering prospects. A medical school, to be connected with the college was established, which has proved of great public benefit.

By an act of the legislature in 1831 the fears of those who ten years before opposed the surrender of the college charter to the State were realized. This act provided that no one holding the office of president in any college of the State should hold beyond the day of the next commencement, unless he should be re-elected by a vote of two-thirds of the electing bodies—a singular measure and obviously aimed at the president of this college. Dr. Allen, as was expected, failed of a re-election. He at once took measures to test the constitutionality of the act, and brought a suit in the circuit courts of the United States. The decision of Justice Story pronounced the act unconstitutional, and Dr. Allen was reinstated in office; it also declared the act of 1820, changing the number of the boards, to be unconstitutional, thus reducing them to their original number. Dr. Allen retired from the presidency in 1839, and was succeeded by Rev. Leonard Woods.

In 1844 an event occurred of great interest to the college. Having a reversionary interest in certain property bequeathed by Mr. Bowdoin to a nephew, on the death of the nephew without issue in England, where he had resided, the property was supposed to revert to the college. The matter at issue involved intricate legal questions, and eminent counsel were enlisted. The result was a compromise, and about $38,000 inured to the college, which justified the erection of the fine stone building in Romanesque style which contains the chapel with a beautiful interior, the library and art halls, and is a prominent object in the college grounds.

The college in its original conception and in its administration has been under the control of the Congregational body. Its resources having become seriously reduced by the financial disturbance of the country, there was a special necessity of determining in some way its denominational position. Accordingly, through the agency of Prof. Upham, in 1847 a "Declaration," as it was termed, was issued, and the professor by his personal subscription and efforts obtained more than $70,000 for the relief of the college.

In 1862, by a gift of the late Seth Adams of Boston, a hall was erected, and received his name, for the better accommodation of the medical school and other purposes. President Woods retired in 1866, after a long service which had endeared him to a large circle of graduates, and with the respect of the community for his ability and rare scholarship. He was succeeded by Rev. Samuel Harris, D. D., who had been a professor in Bangor Theological Seminary. Dr. Harris resigned in 1871, leaving the strong impress of his character and learning upon the college. He was succeeded by Hon. Joshua L. Chamberlain, LL.D., formerly a professor in the college, a major-general in the war for the Union, and governor of the State of Maine. The friends of the college now rallied earnestly to its support, and various contributions were made towards its further endowment. Massachusetts Hall, the oldest structure on the grounds, was, by the liberality of Hon. P. W. Chandler of Boston, reconstructed into a beautiful cabinet for natural-history collections. Rooms were provided in the chapel for the valuable art-collections, to which also important additions have been constantly made. A laboratory of analytical chemistry was constructed in the old commons hall. A fine granite building, which had been commenced in 1865 as a memorial of graduates who had fallen in the war, but had remained unfinished, has been, by the generous gift of $25,000 by Mrs. Stone of Malden, Mass., completed in the most beautiful manner. A scientific course was established in 1872, the graduates of which have been at once called to important positions in the service of the Government and in public works. Arrangements were also made for the detail of an officer of the U. S. army to give instruction in military science—recently, however, discontinued. Three chairs of instruction have been fully endowed, and three chairs partly endowed, while three new chairs have been established. Since 1872 the funds of the college have been increased by $255,000. The present value of the college property is $750,000. The medical department is also in a flourishing condition. There are now in active service seventeen professors and two tutors. The library has received attention, and a fund is now being raised to place it on a permanent foundation. It contains about 35,000 volumes, and the medical library 4000. The art-collections consist of 150 oil paintings and as many drawings—many of them by masters—and a considerable and increasing number of casts of ancient statuary. The cabinets of mineralogy, geology, conchology, ornithology, botany, and anatomy are extensive and valuable.

There have graduated from the academical department 2028, and from the medical 1300. Of graduates many have won distinction in professional life and in different lines of public service. A full history of the college was published in 1882.

Bowdoin still retains a high standing among the colleges of America, and its means of usefulness are, by the earnest support of its friends, constantly increasing. Among recent gifts are that by Mrs. Stone of Malden, Mass., of $50,000 to endow the chair of mental philosophy, and that of $40,000 by Mr. Henry Winkley of Philadelphia to found the chair of Latin. (A. S. P.)

BOWEN, Francis, LL.D., an American educator and author, was born at Charlestown, Mass., Sept. 8, 1811, and graduated at Harvard College, with the highest honors of his class, in 1833. In 1835 he was appointed tutor in Greek at Harvard, and in 1836 he became instructor in ethics and metaphysics in that institution. In 1839 he went abroad in order to devote a year to study and travel in Europe. On his return he became a resident of Cambridge, and devoted himself exclusively for fourteen years to literary pursuits. Besides contributing to the reviews, he published in 1842 an edition of Virgil and *Critical Essays in Speculative Philosophy*, intended as an introduction to metaphysics and a defence of revealed religion. In 1843 he became the editor and proprietor of the *North American Review*, and held this position for eleven years. He also delivered some courses of lectures on philosophy and political economy before the Lowell Institute. In 1853 he became Alford professor of natural religion, moral philosophy, and civil polity in Harvard College. Besides a number of minor works, he published in 1855 *Metaphysical and Ethical Science applied to the Evidences of Religion*; in 1856, *Principles of Political Economy applied to the Conditions and Institutions of the American People*; in 1864, *A Treatise on Logic, or the Laws of Pure Thought*; in 1870, *American Political Economy, including Strictures on the Management of the Currency and the Finances since 1861*; in 1877, *Modern Philosophy, from Descartes to Schopenhauer and Hartmann*; and in 1880, *Gleanings from a Literary Life, 1838–1880.*

BOWLDER, sometimes spelt *boulder*, from the French "boule," a bowl, or ball, is a term used in geology to designate a rounded fragment of rock. From their origin there are two kinds of bowlders: *First*, those which are found in *place*—that is, upon the rock stratum of which they once made a part. They are called *bowlders of disintegration*, but improperly, since every bowlder owes its being to disintegration in the first place. Solid rock-strata or layers are not met with at the surface of the earth in regions outside of the tropics, on account of their exposure to frost. Water, entering and permeating the rock-masses by capillary attraction, freezes during the winter months, and in so changing from liquid to solid increases its volume. The force created by the resistance of the rock's cohesion to such expansion is irresistible, and the rocks, being devoid of elasticity, must become permanently ruptured, broken into fragments of all dimensions, from huge masses of thousands of cubic feet to nut size. The quarryman says the surface-rock is unfit for building-stone, because it is *rotten*. He must go down to a depth where the frost has not penetrated. In our latitudes this depth is inconsiderable, not exceeding 12 feet, whilst the sinking of a well at Irkutsk in Siberia revealed the rock-strata frozen at a depth of 350 feet. Very high and exposed mountain-peaks—as, for instance, the granitic Pike's Peak in Colorado—will be frozen to a far greater depth, of course, than the soil of the adjoining plains. Hence we find them completely split up and changed to huge heaps of fragments extending downward on the mountain-slopes into the valleys. After the rocks are once cracked and rent, the rain- and wind-storms find innumerable points of attack. The chemical action of water upon certain mineral constituents of the rocks sets in, as upon the feldspar of the granite, which is converted into pulverulent kaolin or clay. The most exposed corners and edges fall first before this incessant attack, and in time the angular prismatic rock-bodies become more or less perfect spheres and ellipsoids; they are *bowlders* now in place, or *in situ*.

The *second* class of bowlders, by some geologists called the "true bowlders" or *erratic blocks*, are not essentially different from the first. They are not *in situ*, and upon close examination they show some characters not found upon the indigenous bowlder. Not quite so well rounded as the latter, they exhibit a remarkable smoothness of surface, a polish in many cases, and not unfrequently a system of parallel furrows, now appearing as slight scratches and again as deep grooves. We find these "erratics," as we may call them, in great numbers north of 40° N. latitude, and very sparingly south of that line, over the United States territory east of the Rocky Mountains. We know that they are really erratic by the total dissimilarity of their mineral composition with that of the solid rocks upon which they now rest; and in many instances by their particular contents in petrified animal and plant forms they can be traced back to the very place whence they came. The high rocky grounds west and north of Philadelphia are made up of highly contorted and laminated archæan rocks—gneiss, mica schist, hornblende schists, serpentine, and quartzites—all of them highly crystalline and showing no trace of petrified animal or plant. All the hilltops of this high ground are covered by a deposit of clayey or loamy gravel. The latter is made up of more or less rounded rock-fragments, ranging between the size of a pea and that of a small house. All of them show the character of an erratic—*i. e.* smooth and even polished surface—yet are devoid of that peculiar flat ellipsoid shape and water-worn smoothness so characteristic of the *pebbles* in mountain-streams. These gravel erratics are chiefly portions of a very hard sandstone, in which the quartz grains are cemented by chalcedonic silica. It bears no resemblance to the gneiss upon which the gravel rests; and not until we ascend either the Schuylkill or the Delaware River to one of the Blue Mountain gaps, 70 miles distant in a straight line, do we find a rock quite similar to it. This is the Medina sandstone, No. Four of the geological formations in an ascending line. By its great hardness it forms the crest of the Blue Mountains. But another portion of Philadelphia erratics is composed of a less tough, more friable sandstone, appearing as a mere aggregation of fossil moulds; that is, fossils themselves have disappeared and left only a negative hollow impression in the rock. The fossils are the cylindrical or prismatic stems of sea-lilies—popularly called "screw-stones"—and the shell-casts of a very broad-winged, symmetrical bivalve molluscoid, the *Spirifer macropterus*. No rock of this kind is found in Pennsylvania south and east of the Blue Mountains; but it crops out as No. Six formation throughout the Delaware Valley between the Water Gap and Milford, the stone fences being largely made up of it. Thus we know to an absolute certainty *whence* these Philadelphia tramps came, but not yet how they got to their present anchorage, several modes of transportation presenting themselves. Tremendous freshets rushing down the Schuylkill and Delaware valleys might carry everything in their way: ice-floes, bearing on their backs the larger rocks and stranding on a high point, would leave their burden after they melted away; or a great ice-sheet—a glacier forcing its way through the gaps down the valleys and spreading out beyond the mountains—might move all these fragments, and when these were borne along with the ice, grinding the bottom-rock against which they are pressed with the whole weight of the gigantic ice-masses, the bottom-rock would become polished and grooved. Upon the receding and melting of the ice, all this rocky burden would be strewn over the bed of the glacier, and the waters from melting ice would do their part in levelling the rubbish and in depositing the clay and loam between and upon the bowlders. There is a strong probability that the action of all these forces concurred in placing the erratics in their present position. But this belongs to the articles on GLACIERS and the GLACIAL OR ICE PERIOD, to which the reader is referred. Among the more remarkable erratics must be placed the huge masses of Swedish granite found upon the sands of the North German plain, with the whole Baltic Sea between their origin and present location. Nothing but masses of drift-ice could have transported those blocks. (G. A. K.)

BOWLES, SAMUEL (1826–1878), an American journalist and author, was born in Springfield, Mass., Feb. 9, 1826. He began his work in journalism as assistant and successor to his father, who was the owner of a weekly journal, the Springfield *Republican*. This, changed to a daily, became under the son's direction a very notable journal, with reputation, influence, and circulation far beyond the limits of its own locality. Mr. Bowles' marked personality, like that of Mr. Greeley, showed itself in his columns, and his skill as an editor was universally admitted. He died of paralysis, occasioned by the strain of his professional work, Jan. 16, 1878. His most important written works are *Across the Continent* (1865); *The Switzerland of America* (1869); and *Our New West* (1869).

BOWLING GREEN, the county-seat of Warren co., Ky., is on the Barren River at the head of slackwater navigation, and on the Louisville and Nashville Railroad, 114 miles S. of Louisville, and at the junction of the branch road to Memphis. It is a handsome city, having a fine court-house, costing $125,000, a park, two banks (one national), gas- and water-works, two weekly newspapers, a college, a Catholic academy, and several public schools. It is the business-centre of Southern Kentucky, and carries on a large trade in tobacco, hay, grain, and pork. It has also a foundry, woollen-factory, and several mills. It was incorporated as a city in 1810. Population, 5114.

BOWYER, SIR GEORGE, BART. (1811–1883), an English jurist, was born at Radley, Berkshire, Oct. 8, 1811. He studied at Oxford, and was called to the bar in 1839. He received the honorary degree of D. C. L. from the University of Oxford. In 1850 he became a convert to the Roman Catholic faith. In 1852 he was elected to Parliament from Dundalk as a Liberal, and held his seat till 1868, having succeeded to his title in 1860. In 1874 he was elected to Parliament as a Home Ruler from the county of Wexford, Ireland, and held this position till 1880. His principal works are a *Dissertation on the Statutes of the Italian Cities; Commentaries on the Constitutional Law of England; Commentaries on Modern Civil Law; Commentaries on Universal Public Law.* He died June 7, 1883.

BOYESEN, HJALMAR HJORTH, a novelist, poet, and literary critic, was born Sept. 23, 1848, in Frederiksværn, Norway, where his father, Lieut. Sarolf F. Boyesen, was then stationed in a military capacity and was a teacher of the naval academy. He was the oldest of fourteen children. Until his retirement in 1875 his father was an officer in the Norwegian army, but spent two years in America (1855–57). He had great enthusiasm for America, and he made each one of his sons promise to spend a year here before settling down in Norway. For this purpose he deposited sums of money with a clergyman in Chicago to be drawn only by each of the sons in person. Hjalmar Hjorth spent most of his childhood with his maternal grand-parent (Judge Hjorth) at Systrand, Sogn, and it was there he received his earliest and most lasting impressions of the Norse life and scenery, which he depicts with much vigor and fidelity in his stories, and especially of the folk-lore and ballads which he heard in the servants' hall in the winter evenings. That servants' hall was a forbidden realm which he had to visit surreptitiously after he was supposed to be in bed. He was sent to the Latin school in Drammen, and entered the university in 1867, and took the *examen philosophicum* in 1868. In 1869 he came to America, where he began life as editor of *Fremad*, a Norwegian-Danish newspaper in Chicago, and in its columns he earnestly defended the cause of the common schools. Desiring an opportunity of making a thorough study of the English language and literature, he accepted a professorship of Latin and Greek in Urbana University, Ohio, where he remained until 1873, when he went to Leipzig and studied Germanic philosophy under Zarnoke and Hildebrand one year, and on his return to America in 1874 he was made assistant professor of German at Cornell University, and professor of German literature in 1875. He remained there until 1880, when he removed to New York with a view of devoting himself entirely to literature. In 1881 he accepted an instructorship in German in Columbia College, and was appointed Gebhard professor of German in 1882. His first novel, *Gunnar*, written in Urbana in 1871–72, was published serially in the *Atlantic Monthly* in 1873, and appeared in book-form in 1874 (4th ed. 1879). It was published in Germany, translated by Paul Jüngling, in 1879. His second novel, *A Norseman's Pilgrimage*, appeared as a serial in *The Galaxy*, and in book-form in 1875 (German ed. by Jüngling, 1880). *Tales from Two Hemispheres*, a collection of excellent short stories, were written for *Scribner's Monthly*, and appeared in book-form in 1876. This was followed by *Goethe and Schiller* and by *Falconberg* (a romance) in 1878. In 1881 appeared *Ilka on the Hilltop* (a collection of short stories) and the novel *Queen Titania*, and in 1882 *Idyls of Norway, and Other Poems*. Besides these volumes he has written extensively for the literary departments of the leading American periodicals. All his shorter stories have been several times translated into German, and have enjoyed deserved popularity. In 1879–80, Boyesen was again abroad, and spent the greater part of his time in Italy, but also some months in France and Germany. He made the acquaintance of the Russian novelist Tourguéneff in 1873, and has been in close correspondence with him ever since. Personally and by his writings Tourguéneff seems to have had great influence on Boyesen's later works, while his first work, *Gunnar*, a charming story of Norse peasant-life, is the result of his study of Björnson. Boyesen is an author of great merit, an industrious and prolific writer, and he has acquired a rare command of pure English. (R. B. A.)

BRACE, Charles Loring, an American author and philanthropist, was born at Litchfield, Conn., June 19, 1826. He graduated at Yale College in 1846, and studied theology at New Haven and in the Union Theological Seminary, New York. In 1850 he set out on an extensive journey in Europe, and in the following year was arrested and imprisoned in Grosswardein Castle in Hungary by the Austrian Government on suspicion of being an agent of revolutionists in America. He was tried twelve times before a court-martial, and was finally released by the interposition of the American *chargé d'affaires* at Vienna, C. J. McCurdy. As a result of this journey two books were published in New York and London—*Hungary in 1851* and *Home Life in Germany* (1853). Upon his return to America, with a few others he founded the "Children's Aid Society of New York" for the saving of abandoned street-children and instruction of the poorest boys and girls. In 1854 he established the first "newsboys' lodging-house." From that time till 1882 this house has sheltered 200,000 homeless boys. In 1855 he founded in New York an Italian industrial school, and in 1856 a similar school for Germans. The Children's Aid Society has in thirty years (1883) sent to homes in the country nearly 60,000 street-waifs; it supports twenty-one day-schools and fourteen night- or half-time schools; it manages six lodging-houses for boys and girls. It thus cares for 12,000 different children each year. Its annual income is about $225,000, and its property is valued at $500,000. In 1854, Mr. Brace was married to Miss Neill of Belfast, Ireland. In 1856 he travelled in Norway and Sweden, and in 1857 published *The Norse Folk*. His other publications are —*Short Sermons to Newsboys* (1861), *The Races of the Old World* (1863), *The New West* (1868), *The Dangerous Classes of New York* (1872), *Gesta Christi* (1883). The last-named is a history of humane progress under Christianity.

BRACKETT, Anna C., an American teacher and author, was born at Boston, Mass., 1836. She graduated at the Normal School at Framingham, Mass., in February, 1856, and began teaching in the summer. In September she became assistant in the normal school, and remained there till 1859, when she went to Charleston, S. C., to be assistant in the Girls' High and Normal School. In 1861 she returned to the North, and became assistant in the High School at Cambridge, Mass. In 1862 she took charge of the City Normal School at St. Louis, Mo., and remained there till 1871, when she opened a school for girls in New York City, which she still conducts. She has been a contributor in prose and poetry to magazines and newspapers and a constant writer in educational publications. She has written *The Education of American Girls*, 1874, compiled *Poetry for Home and School*, 1876, and translated Rosenkranz's *Pädagogik als System*.

BRACKETT, Walter M., an American artist, was born at Unity, Maine, June 14, 1823. He has painted portraits and other works, but is celebrated for his spirited pictures of game-fish. His best-known work is a series of four representing the capture of a salmon: these are entitled respectively The Rise, The Leap, The Last Struggle, and Landed. Brackett is a skilful painter within the limits of his specialty. The series above referred to, and others of his performances, have been successfully reproduced in color, and have enjoyed great popularity. This artist is one of the original members of the Art Club of Boston.

BRACQUEMOND, Joseph-Félix, a French artist, was born in Paris, May 22, 1833. He studied under G. Guichard. Since 1872, Bracquemond has been connected with the porcelain and faïence manufactory of the Havilands, and has had charge of a branch of the Limoges establishment at Auteuil. He is himself an accomplished and enthusiastic artist, and he has called about him a company of able assistants. The result of his employment has been to greatly raise the artistic repute of the Haviland wares and to give a new impulse to the ceramic art. Before devoting himself to ceramics Bracquemond achieved great celebrity as an etcher, and was esteemed one of the ablest workers with the needles and the acid in France. He has executed a large number of plates, among the most celebrated of which are Erasmus after Holbein's portrait and The Tourney after Rubens, both of which were ordered by the Government. This artist has received medals both for his portraits and his etchings.

BRADDOCK, a town of Allegheny co., Pa., is on the Monongahela River, 10 miles S. E. of Pittsburg, and on the Pennsylvania and the Baltimore and Ohio Railroads. Here Gen. Edward Braddock was defeated and killed in 1755. The town has three hotels, an opera-house, public hall, three weekly newspapers, and is in part lighted with the electric light. The principal industrial establishments are Bessemer steel-works and large car-works; the other industries are mining and boat-building. It was incorporated as a borough in 1868. Population, 3310.

BRADDOCK, Edward (died 1755), a British general, was the son of Maj.-Gen. Edward Braddock, who retired from the service in Sept., 1715, and died at Bath, England, June 15, 1725. Though both father and son seem to have been favorites at court, the family is unknown, and no others of that name have been in the service. The son entered as ensign in the Coldstream Guards, Oct. 11, 1710, and was made lieutenant in 1716. He was a brave, well-trained soldier and a rigid martinet, but in private life dissolute, a gambler, and a debauchee. He fought a duel with Col. Waller with sword and pistol, May 26, 1718. He especially showed a hard-hearted disposition when his sister, after losing her fortune, committed suicide at Bath in 1731. Having been made captain in the foot guards, Feb. 10, 1736, he served in the Netherlands, and was present at the battles of Dettingen and Fontenoy, after which he was promoted to be first major of his regiment. Returning to England in July, 1745, he served with the duke of Cumberland in Scotland, and was made lieutenant-colonel in November. He was appointed brigadier-general April 23, 1746, commanded a detachment in the expedition against Quiberon in September, and continued in service in the Netherlands till the end of 1748. In 1753 he went to Gibraltar to take command of the Fourteenth foot, and restored order in that unruly regiment. He was appointed major-general March 29, 1754, and in September commander of all His Majesty's troops in North America. He sailed from England Dec. 21, and arrived at Hampton Roads, Va., March 2, 1755. He immediately wrote to the governors of the colonies, calling them to meet him for conference in April, and urging the formation of a common fund for the expenses of the war. Braddock soon learned the reluctance of the provincial assemblies to give up the control of the money raised by them, yet he was diligent in making preparations for the main expedition against Fort Du Quesne. Starting with his regulars from Alexandria, Va., he reached Frederick, Md., April 24, and was obliged to wait there for wagons necessary to transport his stores. Here he was joined by Washington, whom he invited to be his aide-de-camp, and by Franklin, then postmaster-general of the colonies. The latter succeeded in procuring the wagons, and Braddock noted this as almost the only instance of promptness and zeal on the part of the colonists. However, he rejected the cautions of Franklin and others with regard to ambuscades of Indians, and set out for Fort Cumberland, where all the forces were to assemble. They consisted of 1000 regulars, 30 sailors, 1200 provincials, and a few friendly Indians. On the 7th of June they started by the path which Washington had marked nearly two years before, and a passage was slowly cleared for the army. On reaching Little Meadows, June 18, Braddock decided to leave the baggage in camp in charge of Col. Dunbar and push forward with a light division. The French commander, M. de Contrecœur, being informed of his movements, was preparing to surrender Fort Du Quesne, when Capt. Beaujeu proposed to make an ambuscade, and persuaded the Indians to follow him. On the morning of July 9th the British advance, under Col. Gage (afterwards Gen. Gage), when within seven miles of the fort, was suddenly attacked by a motley band of French and Indians. The British returned the fire, and Beaujeu fell, but Dumas succeeded to the command and restrained the Indians from immediate flight. Braddock, hearing the sound of the conflict and pressing forward, found his soldiers falling back in confusion, and vainly strove to rally them against their invisible foes. When the main body of regulars came up he refused to allow them to follow the example of the provincials and seek shelter behind the trees, as advised by Washington. They fought with desperate bravery till late in the afternoon, when the general, abandoning all hope of victory, ordered a retreat, which forthwith became a rout. Though mortally wounded, he continued to give orders, and when the regulars fled he was borne from the field by a few Americans. He was carried in a tumbril fifty miles to Dunbar's camp, where, after committing affairs to Washington, he died, July 13, 1755. Of 1460 men, including 89 commissioned officers, who entered the fight, 827, of whom 63 were officers, were killed or wounded. Of Braddock's aides, Washington alone escaped unhurt. The vast amount of military stores which had been transported through the wilderness with such difficulty was destroyed. The total loss of the French and Indians was 57, of whom 5 were officers. Braddock's military chest with £25,000 and his cabinet were captured; his instructions from the British ministry and private papers were sent to Canada, and thence to France. The defeat exposed the frontiers of the middle colonies to inroads of the savages, and compelled the inhabitants to resort to strenuous measures for self-defence. Dreadful as was the blow at the time, it taught the colonists that the rifleman of America was, in his own forests, superior to the rigidly-disciplined regular of England, and served to prepare them to maintain their rights in the coming struggle for independence.

See the *History of Braddock's Expedition*, by Winthrop Sargent, published by the Pennsylvania Historical Society (Phila., 1855). (J. P. L.)

BRADFORD, a city of McKean co., Pa., is 6 miles S. of the New York State line, on a branch of the New York and Erie Railroad. It is also on the Rochester and Pittsburg Railroad, and is connected by other roads with Warren, Kendall, Kinzua, Eldred, and other towns of the oil-region adjacent. It has six banks (two national), several hotels, two daily and one weekly newspaper, nine churches, and four schools. Its business and manufactures are all connected with the production of oil. It has a park and water-works, and is lighted with gas. It was a small village until oil was discovered in the vicinity, but has since grown rapidly, and in 1879 was incorporated as a city. Its population, which in 1870 was 1446, in 1880 had increased to 9197.

BRADFORD, William, an American artist, was born at New Bedford, Mass., in 1827. He was originally engaged in mercantile pursuits, and practised at painting for pastime. Gradually, however, his interest in the study of coast-scenery increased, and his success with the public was such that he was induced to devote himself exclusively to painting. It was the novelty and interest of the subjects to which he gave his attention that gained applause for his works, quite as much as their technical merit. As a technician he is hard and labored, but he has an excellent feeling for picturesque effect, and, being the first to represent with any degree of adequacy the icebergs and the ice-bound coast of Labrador and the Arctic regions, his pictures have a particular interest and value. Bradford has visited the Arctic regions several times for the purpose of sketching. Among his principal works are The Steamer Panther among the Icebergs, Field-Ice in Melville Bay under the Midnight Sun, Fishing-boats in the Bay of Fundy, Shipwreck off Nantucket, Lighthouse in St. John's Harbor, and Fishing-boats Getting under Way. Bradford's works have been even more popular in England than in America. His Field-Ice in Melville Bay was purchased by the queen, while others of his pictures fell into the hands of scarcely less influential patrons.

BRAGG, Braxton (1815–1876), a general in the Confederate army, was born in Warren co., N. C., in 1815. He graduated at West Point in 1837, and was appointed second lieutenant of the Third artillery. He was engaged in the Seminole War, and served in the

South and West until the Mexican War, where he served under Gen. Taylor. His whole career in Mexico was brilliant and his promotion rapid. At Buena Vista he was in command of a battery of light artillery, and distinguished himself by his coolness and courage. After the Mexican War he retired from the army and became a planter in Louisiana. When the Civil War broke out Col. Bragg was made commander-in-chief of all the State troops in Louisiana. When the provisional government of the Confederate States was established at Montgomery, Ala., he was appointed brigadier-general and placed in command at Pensacola, where he remained during the summer and autumn of 1861. In February, 1862, he was made a major-general, with his headquarters at Mobile, in command of the second division of the Confederate army. At the battle of Shiloh, April 6, Gen. Bragg commanded the centre of the Confederate army. He was soon after made a full general and appointed commander of the department of the Mississippi. On Sept. 5, 1862, he marched northward through Tennessee and captured Munfordville, Ky., with 4000 prisoners, but afterwards declined battle with the Federal general Buell, who recaptured Munfordville and covered Louisville. After the battle of Perryville, Bragg retreated to Tennessee. Efforts were then made to have him removed from his command, but he was retained, and on the 15th of November appeared before Nashville, where the Federal army under Gen. Rosecrans was preparing for a forward movement. After the battle of Stone River, which lasted with varying fortunes for five days, and terminated on Jan. 4, 1863, Gen. Bragg retreated to Tullahoma, Tenn., where he remained inactive for several months. Late in the summer of 1863, having been reinforced, Gen. Bragg determined to risk another engagement, and the battle of Chickamauga, fought Sept. 20, proved a brilliant but barren victory for the Confederates. His disastrous defeat at Missionary Ridge, Nov. 25, 1863, compelled him to retreat to Dalton, Ga., and he soon after asked to be relieved of the command, which request was granted. On Feb. 24, 1864, he was called to Richmond and made military adviser of Jefferson Davis. His last services in the field were in North Carolina, where he fought the undecisive battle of Kinston, March 8, 1865. He died at Galveston, Texas, Sept. 27, 1876.

BRAIDWOOD, a city of Will co., Ill., is on the Chicago, Alton, and St. Louis Railroad, 57 miles S. W. of Chicago. It has two hotels, two weekly newspapers, a music-hall, public library, five churches, and four public schools. Its principal industry is the mining of bituminous coal, an extensive field of which, with seams 3 feet thick, underlies the neighborhood at a depth of 80 to 100 feet. This was discovered in 1865, and what had been an unoccupied, barren prairie speedily became a town, which was incorporated as a city in 1873. Population, 5524.

BRAINERD, the county-seat of Crow Wing co., Minn., is on the E. bank of the Mississippi River 150 miles N. of St. Paul and 135 miles W. of Duluth, on the Northern Pacific Railroad, at the junction of the Western Railroad of Minnesota. It has eight hotels, a national bank, a daily and a weekly newspaper, seven churches, and six schools. It has two large saw-mills, a sash-and-door factory, and large railroad machine-shops. It is in a pine forest; was settled in 1870 and incorporated as a city in 1881. Its population has rapidly increased since 1880, when it was 1865.

BRAKE, FOR VESSELS. The ship brake is a novel application of familiar principles, by which it is claimed that the progress of a vessel in motion can instantly be checked, and the vessel be brought from full headway to a stop within 10 feet. The apparatus, invented by Mr. John McAdams of Boston, Mass., has not yet been brought into practical service, but many experiments were made in Boston harbor during the summer of 1882 with models of different size and with a perfected brake attached to the steamer City Point. This is a small side-wheel passenger-boat, 85 feet long on the water-line, 29 feet beam, and 40 inches draft of water. It is the testimony of those who witnessed these experiments that they fully sustained the claim of the inventor as to the effectiveness of the machine. What were deemed decisive tests were made when the steamboat had a speed of 11 miles an hour, with a steam-pressure of 100 pounds to the inch, the sea being comparatively smooth. Under these circumstances the boat was brought to a stand in moving a distance varying, in different experiments, from 7 to 10 feet. The models were attached to smaller craft, the smallest being a light row-boat propelled with a single pair of oars. Reasoning from all the results arrived at, the inventor has full confidence that the apparatus, being properly proportioned, may with similar effectiveness be employed by sea-going vessels of any size, and that any of these may be checked at full speed and the forward progress stopped within the maximum distance named. In the experiments no assistance to the operation of the machine was sought for by reversing the paddle-wheels, nor, in the opinion of the inventor, will such co-operation by reversal of paddle-wheel or propeller be important, because the whole effect can be produced before the engine can be reversed. And it is an incidental advantage claimed that the liability to breakage or derangement of machinery by reversal is avoidable.

See Vol. IV. p. 191 Am. ed. (p. 211 Edin. ed.).

The check on the vessel's progress is produced by the opening out laterally from the stern-post and under the vessel's run of two iron or steel-plate wings or fins, one on each side. These hinge on the stern-post, and when open are firmly held in place by stays of bar iron or steel. When fully open their position is at right angles with the keel. In opening, the initial thrust is produced by a spring which acts when its fastening within the hull of the vessel is released. This thrust projects the forward edge of each fin an inch or two out from the vessel's side, and the action of the water under the ship's run instantly forces the fin wide open. The stays work through water-tight tubes carried upward at an angle within the vessel's hull. The fins are nearly but not absolutely flat, being moulded to the shape of the hull. The requisite stiffness is given them by flat cross-bars riveted through the plates. The plates used on the City Point were of steel, $\frac{3}{16}$ inch thick near the hinges, graduated to $\frac{1}{8}$ inch at the outer or forward edges. In practical use it is proposed that that part of the surface of the hull against which the fins lap when closed shall be cut away or countersunk to a depth equal to the thickness of the plate, so that when closed the fins shall be flush with the general surface. The fin is closed by means of a chain attached to the inside of the plates at the proper vantage-point and operated from within the vessel by a capstan or windlass. The chain, like the stays, passes inward and upward through a water-tight tube, and it serves, with the stays, to sustain the pressure brought upon the fin when open. It is supposed that one chain for each fin will generally be sufficient, but the number of stays will vary with the depth of the fin, which it is intended shall in all cases extend downward to the keel. Each fin used for the City Point measured 48 inches vertically, and two stays for each proved sufficient. In horizontal extension each measured 6 feet. The resistance which, theoretically, a fin can exert against a given pressure or rate of motion makes 6 feet an ample horizontal extension in any case. With increased depth of water the resisting capacity is augmented in more than simple ratio. The paramount advantage claimed for the apparatus is its instant availability as a preventive of collision by one vessel with another or with any fixed or ponderous floating object, thus making navigation in a field of icebergs, or in a tideway near to piers or other vessels at anchor, safe and sure. Danger in any of these forms being imminent, a man stationed at the gearing may instantly respond to command for the safety of the vessel. Incidentally, an advantage of considerable importance arises from the practicability of using either fin singly, whereby a vessel may be turned on her keel expeditiously. It is supposed that the appliance will chiefly be useful for steam-going craft. Liability of the apparatus to become inoperative is anticipated by so attaching the hinges to the stern-post that either fin may be unshipped and hoisted aboard. It may be added that in the experiments made the sudden stopping of the vessel was not attended by any uncomfortable jar, the water serving to cushion the impact. (D. W. B.)

BRANDES, George Maurice Cohen, a Danish author, was born at Copenhagen, Feb. 4, 1842, of a Jewish family. After studying philosophy and æsthetics at the university of his native city, he made journeys to France, England, Germany, Switzerland, and Italy, entering into intimate relations with the foremost freethinkers of the time. His reputation as a brilliant writer had already been established by his essays on *Roman History* and on *Fate in Ancient Tragedy*, when his work on *Dualism in the Latest Philosophy* (1866) gave rise to a fierce controversy, increased by his translation of J. Stuart Mill's works on *The Subjection of Women* and on *Utilitarianism*. In his *Æsthetic Studies* (*Æsthetiske Studier*, 1868) and his *Criticisms and Portraits* (*Kritiker og Portraits*, 1870) he shows himself a disciple of M. Taine, and his work on *French Æsthetics* (*Den franske Æsthetik i vore Dage*, 1870) is a defence of his master's system. His most important work is *The Main Currents of the Literature of the Nineteenth Century* (*Die Hauptströmungen der Literatur des XIX. Jahrhunderts*), of which four volumes were published in Danish and in German (1872–76). In this work he endeavored to trace and prove a gradual intellectual emancipation through the first half of the present century. The agitation caused by his former works was roused to a still greater height by the tone of this new publication, and his opponents succeeded in preventing his appointment as professor in the University of Copenhagen. In 1877 he published an excellent biography of the Danish philosopher Sören Kierkegaard and sketches of Danish poets (*Danske Digtere*). In the same year he removed to Berlin, and he afterwards wrote and lectured chiefly in German. He has published *Esaias Tegnér* (1878), *Lord Beaconsfield* (1878), *Moderne Geister* (1881), *Björnson und Ibsen* (1882). He also revised and enlarged the German translation of his great work, adding a 5th volume on the Romantic school in France, and a 6th on "Young Germany." By his labors the study of the literature of other countries has been greatly extended throughout the north of Europe. In Denmark and Norway an entire school of poets and prose-writers follows in the path marked out by him. In the latter part of 1882 he was recalled to his native land to deliver regular courses of lectures on literature. He is one of the chief contributors to the *Deutsche Rundschau*. He is a man of extensive knowledge, great energy, and untiring industry, a keen critic, an earnest thinker, and a very brilliant writer.

BRANT (Eng. *brand*, *brent*, *brant*, equivalent to *burnt*, from the color), a kind of goose, *Anas* or *Anser branta* or *brenta*, now usually called *Bernicla brenta*. The orthography of the English word has long fluctuated, but, in this country at least, has settled in *brant*. This species, belonging to the same genus as the Canada wild-goose (*Bernicla Canadensis*), is common to Europe and North America; it is chiefly maritime, but also found in suitable places in the interior. It measures about two feet in length and four in extent of wings; the bill, feet, head, neck, and fore part of the body are black, the neck with a small patch of white streaks on each side; other parts dark-gray, blackening on the wings and tail. whitening on the tail-coverts. A darker-colored variety, known to gunners as the black brant, is peculiar to North America (*B. nigricans*).

BRANT, Joseph, whose Indian name was Thayendanegea (1742–1807), a famous Mohawk chief, was born in Ohio about 1742. He is supposed to have been a grandson of one of the five Indian kings who visited England in 1711 and are mentioned by Addison in the *Spectator*. When only thirteen years of age, with two older brothers, he followed the Mohawk king Hendrick in Sir William Johnson's campaign against the French at Lake George. About 1760 he was sent by Sir William to Rev. Eleazar Wheelock's Indian school at Lebanon, Conn., and in 1772 he acted as interpreter to a missionary. Sir William, who was superintendent of Indian affairs, and had taken Mollie Brant, Joseph's sister, as his concubine, frequently employed him as an agent among various tribes. After Sir William's death in 1774, his son-in-law, Col. Guy Johnson, became superintendent, and made Brant his secretary. When the Revolution broke out the Mohawks, under the influence of Johnson, adhered to the British cause. Brant went to Canada, and thence to England, where he had access to the nobility. His picture was painted by Romney for the earl of Warwick. Returning to Canada in 1776, he took part in the hostile operations on the northern frontier of the colonies, and received a commission in the British army. Though he attained the rank of colonel, he was generally known as Captain Brant. He fought in the battle of Oriskany, Aug. 6, 1777, where the Indians and the Tories were defeated in the bloodiest encounter, in proportion to the numbers engaged, that occurred during the war. In company with the Johnsons and the Butlers he led the Indians in many raids on border settlements in New York, but was not present at the massacre of Wyoming, as was popularly supposed. In the summer of 1779, Gen. Sullivan made an expedition against the Indians in Western New York, and, after a fight in which Brant was engaged, destroyed their village at Newtown, near the present site of Elmira. In revenge for this, Brant the next year, with 300 Indians and Tories, laid waste the Mohawk Valley. When the war was over the Six Nations were mortified to learn that nothing had been said in the treaty about them. The Mohawks were then encamped on the American side of the Niagara River, but as Brant said they were determined to sink or swim with the English, he went to Governor-general Haldimand and asked for a tract of land on the north side of Lake Erie, which was granted. Brant now devoted himself to the arts of peace, and labored earnestly for the improvement of his people, especially endeavoring to prevent the introduction of ardent spirits among them. He tried to form a confederacy of the tribes in Western Canada, but was unsuccessful. In 1785 he again visited England, and was treated with great distinction by the nobility and by the prince of Wales, afterwards George IV. He raised funds to build a church, and obtained some reparation for the losses the Mohawks had incurred by adhering to the king. He published the *Gospel of St. Mark and the Book of Common Prayer in the Mohawk and English Languages*, London, 1787. He also visited the United States and had interviews with the statesmen and veterans of the Revolution; but those who had suffered by his raids hated him intensely, and his life was often threatened. He maintained the right of the Indians to the territory north-west of the Ohio, and in 1791 was present with 150 Mohawks at the defeat of Gen. Arthur St. Clair on the Miami River. In his later years he was much troubled by the efforts made to drive the Mohawks from their lands, and by plots against his authority, in which Red Jacket was conspicuous. He sent two of his sons to Dartmouth College, where the son of his former teacher was president. He died on his estate at the head of Lake Ontario, Nov. 24, 1807. His youngest son, John, became a chief, and took part in the war of 1812. The *Life of Joseph Brant*, by W. L. Stone, is his most complete biography.

BRASSEY, Sir Thomas, an English economist and writer on naval affairs, was born at Stafford in 1836. His father, Thomas Brassey, was a distinguished railroad contractor. The son was educated at Rugby and at University College, Oxford, from which he graduated in 1859. He was called to the bar in 1864, but never practised. In 1865 he entered Parliament as member for Devonport. Since 1868 he has been member of Parliament for Hastings, and has devoted himself chiefly to naval matters. In 1869 he was commissioned as lieutenant in the royal navy reserve, and in 1873 he assisted in forming the naval artillery volunteers. He has made long yacht-voyages and spent much time in travelling, accompanied by his wife. After several voyages to the Mediterranean, to the United States, and to Canada, he undertook in 1876 a voyage around the world, which has been admirably described by Lady Brassey in *The Voyage of the Sunbeam* (1877). She has also published *Sunshine and Storm in the East* (1878), giving accounts of voyages to Cyprus and Constantinople. In 1880, Mr. Brassey received the honor of knighthood (K. C. B.) and was made civil lord of the admiralty. Besides numerous pamphlets on naval affairs and social questions, he has published *Work and Wages* (1872); *British Seamen* (1877); and *Lectures on the Labor Question* (1878).

BRATIANO, Demeter, a Roumanian statesman, was born at Sitesti in 1820. He received his early education in the lyceum of St. Sabbas in Bucharest, and continued it in Paris, where he took the course of jurisprudence of the Sorbonne. He remained in that city from 1836 till 1848, and was elected president of the "Société de la Jeunesse Roumaine," of which Lamartine was honorary president. During his residence in Paris he became a warm personal friend of Michelet and of Quinet. He continued his studies until the Revolution of 1848, during which he and his brother fought upon the barricades. In the same year he returned to his native country. Full of the new ideas of liberty and social regeneration, he actively co-operated in the Roumanian revolutionary movement, and accompanied an envoy of the French Republic to Pesth and Vienna with the purpose of combining the Hungarian and Roumanian movements. After the proclamation of the constitution he was one of the deputation sent to Constantinople to obtain recognition from the sultan. When the revolutionary movement failed he proceeded to Paris, and in 1852 to London. There he vainly sought to induce the English statesmen to take some active measures concerning Roumanian affairs, and became a member of the European revolutionary committee which held its meetings in that city. In the succeeding congress of the powers at Paris he, at the request of Lord Palmerston, accompanied the English plenipotentiaries to give information to the delegates concerning the principalities. In 1857 he received permission to return to his country with the other exiles. Becoming a deputy to the convocation of the Divan *ad hoc*, he prepared a memoir upon the resolutions adopted, and was charged, with M. Golesco, to sustain them before the various cabinets of the Western powers. After the double election of Prince Couza, M. Bratiano was nominated to the first cabinet as minister of foreign affairs. In succeeding cabinets he became successively minister of the interior, of worship, of instruction, and of public works. During this period he was sent on several missions to foreign powers, and particularly to France. In 1876, when the European conference met at Constantinople, he was commissioned to plead before that body the right of Roumanian neutrality arising from the Treaty of Paris. After the war he was sent to Constantinople to renew relations with the Porte. He remained in Constantinople as Roumanian minister until April, 1881, when he was recalled to Bucharest to form a cabinet. Forced afterwards to quit the ministry, he was elected by a large majority president of the Chamber, to which he has since been re-elected by a unanimous vote.

BRATTLEBORO', a town of Windham co., Vt., is on the Connecticut River, 110 miles W. N. W. of Boston, on the Vermont and Massachusetts Railroad. It has three hotels, two national banks, two savings banks, two weekly newspapers, nine churches, twenty-five schools, and the Vermont asylum for the insane. It has an iron-foundry, the Estey organ-works, a child's-carriage factory, three carriage-works, and two sewing-machine works. It is a picturesque town, with an industrious population, chiefly of native birth. It was settled in 1724. Population, 4471.

BRAZIL. We take up the narrative and statistics of the empire from 1875. After the war with Paraguay, which closed in 1870 with heavy losses of troops and an immense debt, the emperor, Dom Pedro II., determined to avoid, so far as possible, all wars with adjacent countries and devote himself to the development of the resources of the empire. The emancipation measures, which were in progress from September, 1871, necessarily involved large expenditure, and the foreign debt of the empire was increased by an additional loan in 1875 of $26,500,000, and another of $29,185,300 in 1879; but the finances of the empire were so skilfully managed that at the end of 1881 the foreign debt had been reduced by payments of $32,725,125, and its total amount was $114,058,685.

In the spring of 1876 the emperor, desirous of promoting a more extensive commerce and an increased immigration, sailed with the empress from Rio Janeiro, visited all parts of the United States, participated in the opening exercises of the Centennial Exhibition in Philadelphia—to which, by his efforts, Brazil had contributed largely—investigated carefully the political, financial, commercial, educational, and scientific systems of the United States, and then, sailing for Europe, visited most of the countries of that continent, pursuing similar investigations in each. He was eminently qualified to profit by such a journey. He had just entered upon his fifty-second year, and in scientific studies as well as in political economy and statecraft he was well versed. The results of his studies of the institutions of foreign lands have been of great benefit to his country since his return. The emperor and empress landed at Bahia, Brazil, Sept. 26, 1877, after nearly eighteen months of travel, the affairs of the empire having been administered during their absence by Princess Izabel, the daughter of the emperor, as regent. Under the advice of the emperor, the Brazilian Government has offered liberal subsidies to lines of steamships plying to its ports, of which there are now 24 lines receiving an annual subsidy of $1,100,000, and has thus greatly increased its commerce, especially with the United States, France, and Germany. Its exports have risen from about $58,000,000 in 1875 to $115,000,000 in 1881, and the imports from $45,000,000 to $95,000,000. The commerce between Brazil and the United States has increased very largely within the same period. The exports to the United States, which in 1869 were $24,837,403, and in 1875 $42,027,863, had increased in 1881 to $52,782,536, or nearly one-half of her entire exports. Her imports from the United States have also increased, though the U. S. Government did not respond to the offers of the Brazilian Government in the matter of subsidies. In 1869, Brazil imported from the United States merchandise valued at $5,866,604, and from Great Britain in the same year $34,824,040; in 1875, from the United States the imports were $7,742,359, and from Great Britain $34,347,455; in 1881, from the United States, $9,252,415, and from Great Britain in 1880, $33,408,630. Meanwhile, the exports from Brazil to Great Britain had been diminishing, though to other European countries they had increased, yet not as rapidly as to the United States. In 1869, Brazil sent to Great Britain merchandise amounting to $36,562,435; in 1875, to $37,093,025; in 1880, to $26,303,350, or about one-half her exports to the United States.

Another result of the emperor's visit to other countries has been the great impulse given to railway construction. In 1882 there were 2388 miles open to traffic, and more than 1200 more in course of construction. Telegraph lines have increased very rapidly, and are connected by submarine cables with Europe and the United States.

Manufactures are also increasing, especially the production of textiles, iron-working machinery, hats, tobacco and cigars, leather, distilled spirits, and gold and silver jewelry and the polishing of gems. As yet, however, Brazil exports very few of her manufactured products. Her chief exports are coffee and sugar, with some hides and skins, cinchona and other medicinal barks and roots, and caoutchouc. Her imports are mainly of breadstuffs and provisions, textiles, manufactures of iron, steel, and other metals, iron wire and rails, linen and woollen goods, petroleum and other oils, clocks, household furniture, lumber, wooden ware, etc.

Education has experienced great benefit from the emperor's observations in foreign countries. The primary and secondary schools have increased in numbers and efficiency, and in more than half the provinces primary education, while gratuitous, is compulsory. The system of gradation in education is improved, and the superior education, both in the colleges and seminaries and in the professional and scientific schools, is thorough and extensive. A degree from the Imperial College is no empty honor, but represents the results of hard study and fair attainments.

Religion.—The Roman Catholic religion is still the established religion of the state, and the emperor, as "grand master of the Order of Christ," appoints, or confirms the appointment of, all bishops, clergymen, and other ecclesiastical officers. Tithes have been abolished. But, though this is the established religion, all other religions are tolerated, "with their domestic or private form of worship, in buildings designed for this purpose, but without the exterior form of temples." This is the constitutional provision, and it has been still further liberalized by the action of the emperor. No persecution for religious acts or motives is allowed. Protestant marriages, celebrated according to the civil law, are counted valid and respected in all their legal effects. Funds are voted for the construction of chapels and for the subsistence of ministers of different religions. In the colonies, several of which are Protestant, all restrictions are removed. Protestant immigrants are heartily welcomed, and Protestant clergymen are among the personal friends and advisers of the emperor. Missionary labors have been conducted by several Protestant denominations in Brazil for some years, the American Methodist Episcopal Church having been first and most efficient in this work. These missionary organizations have of late established schools for the instruction of the young in both secular and religious studies, and these have received the approval of the emperor.

The *immigration policy* of the empire has been modified and greatly improved; and though Brazil, except in its southern portion, does not yet offer as great inducements to settlers, especially from Northern Europe, as the United States, Canada, or Australia, it is becoming increasingly desirable.

In his policy toward the Indian tribes the emperor is eminently pacific, and has won their affection by the respect he has shown for their rights. The tribes on the banks of the Amazon and its largest affluents are becoming partially civilized, and are industrious and prudent. Those on the higher waters of these rivers are more wild and jealous of any intrusion, but these are mostly, nominally at least, within the control of Peru or Bolivia.

Financial Condition.—The national credit is excellent, better than that of any other South American state. All the foreign loans are secured by the entire resources of the empire, and a sinking fund is provided for each. As an evidence of the increasing confidence felt in the soundness of its financial management, it may be noticed that the Rothschilds have taken all of the Brazilian loans at 5 per cent. interest, and that while the loan of 1871 was issued at the rate of 89 per cent., that of 1875 was issued at 96½ per cent., and that of 1879 at 99 per cent. The foreign debt has been steadily reduced, and is now but little more than $100,000,000. The internal debt amounts to about $290,000,000, and is mostly in bonds, either coupon or registered. There is also a floating debt, the amount of which varies from year to year, but is gradually accumulating. The annual charge on the state for sinking fund and interest in 1879–80 was $18,775,000, or more than one-third of the national revenue. The ordinary revenue for 1879–80 was set down as $58,636,900 and the ordinary expenditure at $58,337,845, showing a surplus of nearly $300,000; but the budgets of 1881–82 and of 1882–83, with a somewhat larger revenue, show a deficit of $664,379 for the first-named year and of $2,025,559 for the second. These deficiencies have to be met by increased taxation, or they go to increase the floating debt. The taxation is not, however, onerous, almost three-fourths of it coming from import and export duties and shipping dues, though the export duty is not desirable for the interests of the nation. Nearly one-fourth is derived from railways, posts, telegraphs, stamps, and licenses, and mines, lotteries, and state establishments. Only about one-fortieth comes from a land-tax.

Area, Lands, and Population.—The area is estimated at 3,287,963 square miles, or 8,515,848 square kilometres. Probably less than one-half of this area has ever been explored, and a much smaller portion has been surveyed. The vast forests and plains of the interior, mostly within the tropics, abound with both vegetable and animal life, and their great wealth will not be realized for many generations to come. There are no very definite data for ascertaining the population. There has been no census since 1872, and that was only partial, embracing but eleven out of the twenty provinces, and leaving out of the account the vast regions of Amazonas, Matto Grosso, and Rio Negro, only inhabited by Indians and a very few whites. Official estimates of 1881, based upon this partial census of 1872, give a population, except the Indians, of 9,608,650. The Indians are roughly estimated by the Brazilian Government at 1,000,000, but they may number twice as many. They do not, for the most part, acknowledge any allegiance to the emperor. Some of the tribes nearer the ocean are partially civilized, and these are employed in the mines and on the plantations. The aggregate population of the empire is probably more than 11,000,000.

For further information concerning Brazil the reader may consult James Orton, *The Andes and the Amazon* (1870); H. M. and P. V. N. Myers, *Life and Nature under the Tropics* (1871); Alfred R. Wallace, *Travels on the Amazon and Rio Negro* (1870); M. de Selys Longchamps, *Notes d'un Voyage au Brésil* (1875); William Hadfield, *Brazil and the River Plate* (1870–76, 1877); Fletcher and Kidder, *Brazil and the Brazilians* (9th ed. 1879); Michael G. Mulhall, *Rio Grande do Sul and its German Colonies* (1873); Antonio Joaquin Ribas, *Direito administrativo Brasiliero* (1874); Franz Keller, *The Amazon and Madeira Rivers* (1874); Conte C. d'Ursel, *Sud Amérique: Séjours et Voyages au Brésil* (1879); Thomas P. Bigg-Wither, *Pioneering in South Brazil* (1878); O. Constatt, *Brasilien, Land und Leute* (1877). (L. P. B.)

BRAZIL, the county-seat of Clay co., Ind., is on Otter Creek, 16 miles N. E. of Terre Haute, on the St. Louis, Terre Haute, Vandalia, and Indianapolis Railroad, also on a branch of the Chicago and Eastern Illinois Railroad. It has a court-house, five hotels, two banks, four weekly newspapers, eight churches, and three schools. Its industrial works comprise an iron-furnace, rolling-mill, two foundries, two machine-shops, a boiler-factory, a saw-mill, two planing-mills, two flour-mills, a woollen-mill, a pottery, marble-works, and a carriage-factory. It has a park and water-works. It was settled in 1840, and incorporated as a city in 1872, and is the shipping-point of the celebrated Brazil bituminous furnace coal. The population has trebled within fifteen years, and comprises various nationalities. Its property is valued at $1,500,000, and the public debt is $60,000. Population, 3441.

See Vol. III. p. 215 Am. ed. (p. 250 Edin. ed.).

BREAD. A baked mixture of any kind of flour and water, whether previously fermented or not, may properly be termed bread. The art of making bread can be traced to a remote antiquity. The Egyptians were not improbably the first people to adopt baking and cooking in ovens. The Bedouin of to-day still adheres, however, to the methods of his ancestors and cooks his unleavened bread in the embers. The Israelites ate leavened bread, except on particular occasions; a portion of the dough from each bread-making was kept until it began to sour, and used for fermenting the new dough. Pliny says the Roman leaven was made from millet mixed with grape-juice, and that it would keep for a whole year. Bread was made with yeast in England in 1634. The process of making "aërated" bread without yeast or leaven was successfully practised in the United States prior to 1854. In England this process was adopted only in 1859. Bread-making by machinery dates back to about 1858.

Although bread may be made from various grains, such as rye, corn, oats, yet wheat is held in the highest estimation for the purpose. The grain, after being ground, is usually separated into three parts—the flour, the pollard, and the bran, the flour forming on an average 75 per cent. of the wheat ground. The bran is mostly removed to impart greater whiteness to both flour and bread, but in doing this a most nutritious element is lost. From the several varieties of flour obtained by bolting three kinds of bread are made: (1) wheaten bread, or "firsts," which is made of the finest flour; (2) household bread, or "seconds," which is somewhat coarser; and (3) brown bread, or "thirds," which is made of flour of various degrees of coarseness. For making firsts the flour is entirely separated from the bran or husks; in the others the bran is not entirely removed, but the coarse bran is separated from the coarsest flour.

The method of making bread usually followed by bakers in the United States is as follows: At first a portion of the water needed for making a required quantity of bread is warmed to 75° or 100°, and salt added to give the bread its flavor. This is next mixed with yeast, and a part of the flour needed for the whole amount of finished dough added. This mixture is then covered up and left in a warm place, when in about an hour fermentation begins. Carbonic acid gas is generated in this "sponge," as this mixture is called; it swells up, and when no longer capable of retaining the pent-up gas it bursts and subsides. After the second or third rising and falling of the sponge the remaining portions of the water, flour, and salt that are required for the needed quantity of dough are added, and mixed with the sponge by more or less laborious kneading. The dough is now left standing for a few hours, then kneaded again, and divided into parts to form the requisite size or kind of loaf. These loaves are set aside once more for an hour or more in a warm place, and the continued fermentation soon expands each mass to about double its former volume, when they are ready for the oven, where they are finally baked.

Various apparatus has been introduced to substitute machine-work for manual labor in the manufacture of bread, and at the present time the kneading, the mixing of the dough, the charging of the ovens, and the returning the baked bread to the basket are all done by machinery.

Watson's Bread-making Apparatus consists of a mixing cylinder provided with a hinged cover and having at one end a sluice-door forming the outlet for the dough. An agitator consisting of several pieces of twisted iron is first placed in this cylinder. The flour, water, salt, etc. are then put into the mixing cylinder, and the agitator—which has imparted to it by means of suitable gearing a rotary motion—mixes the ingredients thoroughly, after which they are allowed for a time to rise. The agitator is then removed from the cylinder, and a piston moved by a rack and pinion is inserted into the cylinder in its stead. The motion of this piston forces the dough out at the sluice-door at a regulated thickness. There it is received upon an endless apron, above which is placed a vibrating dust-box, from which flour is freely sprinkled on the dough while passing from the sluice-door to the dividers, which are a set of rolls or edged blocks on a revolving axle, to divide the dough into blocks of suitable size. From the apron the dough passes to the trucks, which convey it to the oven, and it is then transferred to another truck, which is pushed by hand into the oven.

Dr. Dauglish's Apparatus for the manufacture of aërated bread is described in the ENCYCLOPÆDIA BRITANNICA under BAKING.

An improved method of making "aërated bread," known as the "wine process," consists in forming a wine from malt by mashing, and afterward producing the vinous fermentation in closed vessels. Four gallons of the so-called wine are mixed with sufficient water for a sack of flour, drawn into a closed vessel, and aërated—that is, charged with carbonic acid gas. This aërated water is then mixed with the flour (in strong closed vessels) and kneaded by arms driven by machinery. The dough formed is drawn off by machinery into the required loaf sizes, and at the same moment as the carbonic acid gas passes out of it the dough is raised and vesiculated and ready for the oven, the whole time required for forming a sack of flour into loaves being less than half an hour. This process has many advantages, the pressure in the vessels required being only 20 pounds per square inch, and the oven-heat for baking 100° less than hitherto required in aërated bread.

The Berdan's Automatic Oven, used in Brooklyn, N. Y., is built of brick, 18 feet long, 9 feet broad and 32 feet high, and has a lower and upper story. From a furnace beneath the heat is conducted to and through the oven by means of fire-brick tubes; by means of a self-acting damper connected with the furnace the heat in the oven can be regulated and kept constantly at about 292° Fahr. This oven has two doors in the lower and two in the upper story. Within is an endless chain to which arms are attached, and upon which thirty-two forms are laid about two feet apart. This chain, which can be moved either by hand or by steam-power, revolves perpendicularly through the oven at just such rate of speed as is required to bake the bread with a single revolution; and by means of a conical cylinder the time of the revolution can be regulated to the fraction of a minute. Each platform supports a large bread-pan. Outside the doors of the oven are two cars, which also are moved by the same power that moves the endless chain. When it is put in motion one of the oven-doors rises and an empty pan trundles out of the oven and is placed upon the tender-car, which carries it to a door on the other side of the oven. A pan containing sixty loaves of dough is placed on this car, and when the door before the car opens the loaded pan moves into the oven; the door instantly closes after it, and the pan commences its revolution upon the endless chain. Immediately after the close of this door the other door opens and another pan moves out, and the operation is repeated until the thirty-two cars are filled, the pans always entering at one door and issuing at the other. When all the pans are loaded a pan of baked bread comes out and dumps itself at one door of the oven as fast as the dough is put in at the other door.

Biscuit- or *cracker-making*, which may properly be considered under this head, and is mostly practised on a large scale, especially in this country, consists of several distinct operations—viz., the mixing, baking or kneading, cutting or panning, and baking.

The first operation is usually performed in the cylinder mixer, a cylindrical pan through which passes a shaft carrying four stirrers half a foot apart. These stirrers have the form of an inverted U, and approach to within 1½ inches of the circumference of the pan. The shaft rests in an iron frame, and receives its motion from a cam-gear. The pan is provided on the outside with a wheel and toothed segment for lifting the cover and tipping over the pan, and has generally a capacity of one barrel of flour. It is provided further with shoots for flour, milk, butter, sugar, etc., and the time required for mixing is thirty minutes. From the mixer the dough is carried to the brake or roller, in passing under which it is folded; and this process is continued until the dough is perfectly smooth and even in texture. The machine is run at a speed of 180 revolutions per minute. Return-brakes, and sometimes fluted rollers, are used to expedite the work, and table-brakes are used for very tender dough.

From the brake the dough is conveyed to the cutting-machines, of which there are various kinds, those most commonly used being the cylinder and the stamper. The cylinder is not much used in this country, being far more expensive, yet no more effective, than the stamper. The stamper is made in two forms—that which requires the scrap, or portions of dough between the crackers, to be removed by hand, and the English machine, in which, by an ingenious arrangement of wooden fingers, the crackers are forced downward into a pan, while an ascending apron carries the scrap into a box. An improved form of stamper is manufactured by John McCullum of New York. The iron frame, having at one end a pair of rollers which reduce the dough to about ⅛ inch in thickness, is the same as that of the English machine, but the gauging-rollers are heavier and are provided with a gauge-wheel. The cutters, made of gun-metal and fitted with bristle ejectors for both biscuit and scrap, are in the middle of the machine. There are three endless felt aprons directly beneath the cutter, one of which carries the dough direct to the cutter, another carries it to the pan, and a third carries the scrap to the scrap elevator. The movement of these aprons, as well as that of the brush and gauge-rollers, is controlled by means of eccentrics on the main and cutter shafts working ratchets. This motion is easily adjustable to alter the movement of aprons and rollers. The motion is such that when the stamper is down the web is stationary, and as it rises it moves forward just sufficiently to bring fresh dough into place.

In the so-called "snap"-machine the box containing the dough has its bottom perforated with round holes bevelled inwardly. The dough being placed in the box, screws driven by suitable gearing force down a piston which causes a certain amount of dough to be driven out of the holes in the box. Knives placed opposite each hole then cross over and sever the exuded portions, which fall upon pans placed to receive them. This machine has a capacity of twenty barrels of flour in ten hours.

In the mechanical manufacture of bread and crackers the process of baking has also been greatly improved in this country. Raney's revolving-wheel oven is built of brick with 8-inch walls. Through the chamber passes a shaft on which is fixed a wheel to which the pans are hung. The diameter of the wheel is such that during the revolution each pan is brought within 18 inches of the fire. The fire is built upon an open grate flush with the floor of the furnace, the ash-pit being immediately underneath. The flue is on a level with the grate and at the back of the oven. The top or crown is built in the form of a double arch to receive the superheated air and steam. Motion is imparted to the wheel by a worm-gear on the shaft, and the speed regulated by a break-wheel on the face of the oven. The temperature ranges from 250° to 450°. Bread usually requires in this oven 35 minutes to bake; raised cracker, 3 minutes; fancy crackers, from 3 to 6 minutes. The capacity of this oven is fifty barrels of flour per day.

Prof. Horsford's "Report on Vienna Bread" in the *Report of the U. S. Commissioners to the Vienna Exposition of 1873* is a valuable contribution to the literature of this subject. (A. F. H.)

BRECKENRIDGE, John, D. D. (1797–1841), an eminent Presbyterian minister, was born at Cabell's Dale, Ky., July 4, 1797. When he was only nine years old his father, Hon. John Breckenridge, a distinguished lawyer, who was at the time U. S. attorney-general under President Jefferson, died, leaving three sons to the care of their mother, one of the Cabell family of Virginia, and a woman of great force of character. John graduated at Princeton in 1818, and studied theology while acting as tutor in that college. He was licensed to preach in 1822, and in the same year served as chaplain to Congress. In 1823 he was ordained pastor at Lexington, Ky., and soon after established a religious newspaper called *The Western Luminary*. In 1826 he removed to Baltimore, where he became colleague to Rev. Dr. Glendy. In 1831 he came to Philadelphia as secretary of the Presbyterian Board of Education, and in 1837 he was made professor of theology in Princeton Theological Seminary. While thus employed he conducted two famous controversies on the Catholic question with Rev. John Hughes, then a Catholic priest in Philadelphia, but afterwards archbishop of New York. Reports of these discussions have been published by both sides. He was prominent in the disputes and agitation which led to the division of the Presbyterian Church, and was an intrepid leader in the Old School branch. In 1838 he was made secretary and general agent of the Presbyterian Board of Foreign Missions, and devoted himself vigorously to the promotion of that work till he was obliged to resign in 1840 by the failure of his health. Shortly before his death he was chosen president of Oglethorpe University, Ga. He died at his native place while on a visit to his relatives, Aug. 4, 1841. His writings were few and by no means commensurate with his acknowledged abilities.

BRECKENRIDGE, John Cabell (1821–1875), a Southern statesman and general, was born at Lexington, Ky., Jan. 21, 1821. He was educated at Centre College, Danville, and studied law and practised at Lexington. In the war with Mexico he was major of a volunteer regiment, but did not see much service. After the war he was a member of the State legislature, and in 1851 was elected to Congress by the Democrats. In 1853 he was re-elected after a violent contest. President Pierce offered him the ministry to Spain, but he declined the position. In 1856 he was elected Vice-President, with Mr. Buchanan as President. In 1860 he was nominated for President by the extreme Southern Democrats, who withdrew from the National Convention at Charleston. The rest of the convention assembled at Baltimore and nominated Stephen A. Douglas. Breckenridge received the electoral votes of all the slave States except Virginia, Kentucky, Tennessee, and Missouri, but was defeated by Lincoln. He was immediately elected U. S. Senator from Kentucky, and took his seat in March, but in September went South and entered the Confederate army as brigadier-general, and was soon promoted to be major-general. He commanded a division at the battle of Stone River, Tenn., Jan. 1, 1863, and at Chickamauga, Sept. 19. In May, 1864, he defeated Gen. Franz Sigel at Newmarket, Va., served under Gen. Jubal Early in his advance on Washington in July, and shared in his defeat by Gen. Sheridan near Winchester in September. In January, 1865, he was appointed Confederate secretary of war, and after the downfall of the Confederacy went to Europe, whence he returned to Kentucky in 1868. He died May 17, 1875.

BRECKENRIDGE, Robert Jefferson, D. D., LL.D. (1800–1871), brother of Rev. John Breckenridge, a distinguished Presbyterian minister and theologian, was born at Cabell's Dale, Ky., March 8, 1800. He was educated at Princeton, Yale, and Union Colleges, graduating at the last in 1819. He studied law, was admitted to the Kentucky bar in 1823, and practised for eight years. In 1829 he became a member of the Presbyterian Church, and having studied theology, partly at Princeton, in 1832 was ordained pastor of the First Presbyterian Church in Baltimore, where he remained thirteen years. During this time he became distinguished as a preacher, and engaged largely in controversial writings against Roman Catholicism in the *Religious and Literary Magazine*, which he had established, and to which he was the chief contributor. He also took an active part in the controversies which in 1837 resulted in dividing the Presbyterian denomination, and was the foremost leader of the Old School branch. In 1845 he became president of Jefferson College, Canonsburg, Pa., and pastor of the Presbyterian church there. He removed to Lexington to take charge of a congregation, and soon after was elected by the people of the State superintendent of public instruction. He laid the foundation of the common-school system now in operation there. In 1853 he was made professor of theology in the Presbyterian seminary then organized at Danville, Ky., and established the *Danville Quarterly Review*. In the anti-slavery agitation he held a medium course and advocated the passage of a State law manumitting the slaves in Kentucky. When secession became rampant he was a firm adherent to the Union cause, but he wrote against President Lincoln's Emancipation Proclamation. In 1864 he presided over the Republican convention in Baltimore which nominated Mr. Lincoln President for a second term, and Andrew Johnson as Vice-President. When his health became impaired a few years before his death, he resigned his professorship and withdrew almost entirely from public affairs. His writings are *Papism in the XIXth Century in the United States*, 1841; *Travels in France, Germany, etc.*, 1839; *Internal Evidence of Christianity*, 1852; *The Knowledge of God objectively considered*, 1857; and *The Knowledge of God subjectively considered*, 1859. In addition to these he published a large number of pamphlets on all the public questions of his time—slavery, temperance, education, agriculture—besides those on the religious controversies in which he was so much engaged. His firm convictions on all the subjects that he treated led to a forcible style of expression. He especially excelled in debate. He died at Danville, Ky., Dec. 27, 1871.

BRENHAM, the county-seat of Washington co., Texas, is at the junction of the Austin branch of the Houston and Texas Central Railroad with the Gulf, Colorado, and Santa Fé Railroad, 126 miles N. of Galveston. It has three banks, three hotels, an opera-house, two daily and three weekly newspapers, ten churches, a graded public school, a cotton-compress, oil-mills, and gas-works, and is free of debt. On the north and west it has abundant supplies of timber, and on the south and east broad prairies and cultivated farms. In 1881 it shipped 40,200 bales of cotton. It was incorporated in 1866, and suffered from fires in 1867 and 1873, but has now a good fire company and abundance of water. Population, 4101.

BRÉTON, ÉMILE-ADÉLAID, a French painter, and brother of Julus Bréton. He was born at Courrières, and studied under his brother. As a landscape-painter this artist takes a high rank. He is chiefly noted for his moonlight and winter scenes, and few artists have better succeeded in rendering the silvery tones of moonlight or the peculiar soddenness of water-soaked snow—the condition in which snow is usually seen in France. Émile Bréton's handling is very fine, and his style broad and effective in mass rather than in detail. Frequently his color is coarse and unpleasant, although at times, especially in his moonlight scenes, he succeeds in achieving very admirable color-results. Exemplary pictures by him are A Winter Evening, which was purchased by the Government for the Luxembourg gallery; Moonrise and Sunset, which belong to the Corcoran gallery at Washington; The Canal at Courrières in Autumn, A Village of Artois in Winter, The Star of the Shepherds, and A January Night after a Battle.

BRÉTON, JULES-ADOLPHE-AIMÉ-LOUIS, a French artist, was born at Courrières, May 1, 1827. He studied under Drölling and Devigne. Jules Bréton has devoted himself to the representation of incidents of peasant-life; and, if Millet be excepted, no painter of the present day has rivalled him in this class of works. His strong-limbed and horny-handed men and women win our sympathies by the sombre dignity with which they bend to their toil; and whatever poetry there may be in his works is due to the uncompromising fashion in which he represents the children of the earth struggling for sustenance. The best pictures of this artist are profoundly pathetic, but they are so through their unflinching realism and because of the artist's keen appreciation of the real dignity of labor. He has painted a great number of canvases, nearly all of which are devoted to the most simple incidents of rural life; among them some of the most noteworthy are The Benediction of the Fields, The Recall of the Gleaners, The Weed-Gatherers, The Potato-Diggers, Brittany Washerwomen, The End of the Day, and Evening. The last named was purchased by the Government for the Luxembourg collection, as was also the Benediction of the Fields. Bréton was decorated with the cross of the Legion of Honor in 1861, and was made an officer in 1867. He is the author of a volume of poems entitled *Les Champs et la Mer*, published in 1870.

BREVARD, EPHRAIM (1750?–1780), a North Carolina patriot of the American Revolution, reputed author of the Mecklenburg Declaration of Independence, was descended from a French Huguenot who had gone from his native land to the north of Ireland, and thence to Maryland. The family settled in Mecklenburg, N. C., about 1740. Ephraim, the oldest of eight sons, had the misfortune in his boyhood to lose the sight of one eye, but this did not prevent his receiving a liberal education. He graduated at Princeton College in 1768, studied medicine, and settled as a physician at Charlotte, N. C. During the troubles preceding the Revolution several county meetings were held here, and at one, held May 31, 1775, Dr. Brevard was secretary and prepared a series of twenty resolutions declaring the government heretofore existing now dissolved, branding as traitors those who should henceforth accept offices from the Crown, establishing a new administration for the county, and calling upon all the inhabitants of the country to unite in maintaining their rights. These resolutions were sent to the provincial congress and to the delegates from North Carolina then attending the Continental Congress at Philadelphia. They were printed on June 13, 1775, in the *South Carolina Gazette* in Charleston, copies of which were sent to London by the royal governors of both North Carolina and Georgia as indicating the desperate situation of affairs. Dr. Brevard and his seven brothers all served in the Revolutionary army, and his mother's house was burned on this account by a detachment from Lord Cornwallis's army. When the Southern army was captured at Charleston, S. C., in May, 1780, Dr. Brevard became a prisoner. When released, some months later, his health was so broken that he died soon after at Charlotte, N. C.

BREVET RANK, titular rank of a higher grade than that actually held, conferred upon a military officer as a reward for gallant actions or meritorious conduct. It is usually of the *next* higher grade; thus, a *captain* receives a brevet as a *major*; a *major* as *lieutenant-colonel*, etc.; but for more distinguished service an officer may receive more than one brevet. The word, from the Latin *brevis*, means, in general, *a short written notification, a writ of right*. Adopted in the French, it means simply a *commission*, and in English it is a term used to express the promotion of officers above the rank of captain, after a certain length of service, to real rank, but without increase of pay. As used in the military service of the United States, it means the conferring upon an officer of the army, the marines, or the volunteers in the service of the United States the rank of a higher grade as a reward for unusual exhibitions of valor or skill, and thus declaring that he is worthy of the higher grade of which the title is given to him. It must be observed that the higher grade referred to must have a real existence. To illustrate: in 1871 a captain of marines was entitled to a brevet; the corps had no grade of *major*, and they could only brevet him a *lieutenant-colonel*. After the Mexican War, in 1848, the grade of lieutenant-general was revived in order that General Scott might be *brevetted* to it.

Although there were *brevets* before, the true foundation of the system was laid by an act of Congress on July 6, 1812, by which the President was authorized, without any concurrence or sanction, to confer brevet rank upon officers of the army (only) who were distinguished for "gallant actions or meritorious conduct," or "who shall have served ten years in any one grade." Such officers were not to draw additional pay or emolument, except when in command at a separate post, district, or detachment, or on courts-martial. This sole power of the President was restricted by act of Congress, April 16, 1818, which made the concurrence of the Senate necessary. In March, 1863, it was enacted that volunteers and others in the U. S. service should be included with the army. In March, 1867, as many officers of the army had been serving with higher grade with the volunteers, it was enacted that they might receive volunteer brevets, as well as those based upon their regular rank; and it was also thereafter declared that such brevets should be conferred only in time of war. In July, 1870, officers holding brevet commissions were forbidden to wear any other uniform than that of their actual rank or to use any other than the title of such rank in official communications. (H. C.)

BREWING. The fabrication of *beer* consists, first, in the production of the *wort* and preparing the same for fermentation; second, the principal fermentation of the wort; and, third, the treatment of the beer after the principal fermentation.

See Vol. VI. p. 236 Am. ed. (p. 264 Edin. ed.).

The fluid produced by the process of brewing— *i. e.*, the extracting by water the brewing materials, malt, malt surrogates, and hops—is called the *wort*. The larger part of the wort always consists of water, and the constituents of the brewing materials which may already be soluble or have only become soluble through the brewing process are dissolved in it as wort extract.

Beer contains a number of those combinations which have passed from the brewing materials into the wort. It contains a smaller percentage of dissolved solid combinations than the wort, as sugar and dextrine have been converted into alcohol and carbonic acid by fermentation. Further, succinic acid and glycerine have been formed as secondary products. The nitrogenous organic combinations (proteine substances) and mineral salts in solution are also in less quantities in the beer than they were found in the wort. The percentage of acids, especially *lactic acid* and *acetic acid*, is, on the contrary, greater in the beer than in the wort. Of the constituents of the hop—viz., *hop resin*, the *bitter principle of the hop*, and *tannin*—the hop resin has been separated by the fermentation, and the hop oil has been mostly volatilized.

The initial step in the fabrication of beer is to abstract as completely as possible the valuable constituents of the brewing materials and to bring the wort into proper condition for the process of fermentation. The operations involved in the production of the wort are—1st, the crushing of the malt; 2d, the brewing process; and 3d, the cooling of the wort.

The crushing of the malt is necessary, so that it may be thoroughly penetrated and extracted by the water. It should not be ground too fine for this purpose, but only crushed sufficiently for the hulls and valvelets to burst asunder. When the malt is ground too finely it forms a solid filtering layer in the clarifying pan, through which the wort can only percolate with great difficulty, and never quite completely. The drier the malt is the more brittle it becomes, and the more care must be used in crushing it; newly kiln-dried malt is easily crushed too fine. Formerly, the malt was generally ground in common flour-mills. The malt was first moistened or sprinkled with water to prevent it from becoming heated between the millstones and from being ground too finely. Malt crushed in this manner must be quickly used, as it becomes easily heated and spoils. At present, malt-crushing machines especially designed for this purpose are used. Among those most frequently to be met with is the Stoll patent malt-mill. Its principal feature is the substitution of iron rollers for the millstones. It consists, besides these rollers, of a hopper for conveying the malt to the rolls, a device for distributing it, sieves, and magnets for separating the iron particles so as to conserve the rollers. The producing capacity of this mill depends upon the diameter of the rolls and the velocity at which they are driven. Rolls of larger diameter are in every way preferable to small ones, for the reason that these latter require to be driven at a greater velocity than the former for the same amount of product. But if the velocity is increased the rollers work more by impact than by pressure, the consequence of which is that the malt is crushed much finer and the wear and tear on the machine much greater.

The malt-mill is so located that the crushed malt has not to be transferred far. In breweries of modern construction the malt-mill stands on the floor of the mill-room, and the crushed malt is lifted into special malt-wagons by an elevator. These wagons taper toward the bottom, are constructed of wood, and are entirely closed with the exception of openings on the top and bottom, which may be closed by a slide. These closed wagons have the advantage of preventing the dust from flying, and are a decided improvement upon the method of carrying the crushed malt in bags to the mashing-tun. Only sufficient malt for one day's brewing should be crushed at a time, as it is apt to spoil if allowed to stand for several days in bags or wagons.

The *brewing process* is again subdivided into three operations—viz., *mashing*, *clarifying*, and *boiling the wort with hops*.

The brewing process is performed in that part of the brewery called the *brew-house*. This latter, according to the best methods of construction, is a vaulted room unobstructed by pillars. The floor is paved, and has a fall towards the opening of a channel which quickly carries off all waste water. Great care is taken to secure thorough ventilation, the mash-tun and wort-pan being provided with vapor pipes which carry the vapors into the open air. Hot- and cold-water pipes are laid through the brew-house, and cocks are placed conveniently wherever the water is required. The cold water comes from the cold-water reservoir—the hot water from the condenser, where it is heated by steam from the engine. The fixtures of a completely fitted up brew-house are—(1) The mash-tun, with the preparatory mashing apparatus and false bottom; (2) The clarifying-tun with straining bottom, clarifying battery, sparging apparatus, and grubbing-machine; (3) The wort-pan, with the hop-strainer; (4) The pumps.

The mash-tun is the vessel in which the malt-grist is mixed with water and where the mash is formed. It is placed upon wooden or iron supports about six feet above the floor, at the same height with the mash-copper, or somewhat higher or lower, so that the mash can be brought from the tun to the mash-copper, and from this into the mash-tun, without pumping. Mash-tuns are mostly constructed of oak, but recently tuns of sheet iron are preferred. If of the latter material, they are either jacketed or cased in wood to prevent a too quick cooling of the wort. In most breweries the mash-tun has a false bottom, and serves then at the same time as a clarifying tun.

On the edge of the mash-tun is mounted a self-acting preparatory mashing apparatus. This consists of a copper or cast-iron cylinder three to four feet high, and into which the malt-grist falls from above and water flows in from the side, so that the two become intimately mixed. The water strikes the malt in fine sprays, which cross each other in different directions; and, what is of great importance, the machine also clears itself completely in this manner. To prevent breakage, the machine is started slowly when the mash is thick or in mashing up after the grains have settled to the bottom; and for this purpose the gearing is so arranged as to admit of different speeds.

The vessel into which the mash is brought after mashing, and in which the grains are separated from the wort, is called the *clarifying tun*. In modern construction this is placed at equal height with the mash-tun, opposite to, but higher than, the wort-pan. To save room, the clarifying tun is sometimes placed directly beneath the mash-tun and lower than the wort-pan, which necessitates the continual pumping of the wort into the wort-pan, and is not good practice. As regards mode of construction and material, the clarifying tun is like the mash-tun, only not so deep. Double bottoms are placed in both the mash-tun and the clarifying tun, between which steam is introduced to prevent the cooling off of both grain and wort during the process of clarifying.

The clarifying bottom (straining bottom) consists of a number of perforated or finely-slit copper or iron plates placed upon the bottom of the clarifying tun, and serves the purpose of separating the wort from the solid constituents of the mash. These plates are provided with rests or legs half an inch to an inch high, thus leaving a small space between the clarifying bottom and the bottom of the tun.

The clarifying battery consists of a number of copper suction-pipes, which conduct the wort through openings below the clarifying bottom into an open collecting channel or into a closed collecting pipe. The suction-pipes are provided with "spent-taps," which can be opened more or less as may be required; and if they pass into a collecting pipe, they must each be provided with a small cock, so that samples of the wort may be taken to see whether it runs off clear. Where a collecting channel is used, it is provided with a movable lid to protect the wort and prevent cooling off. The pipes conveying the wort are profitably covered with a non-conductor during the cold season; they are cleansed either with brushes or by letting steam pass through them. Through the collecting channel or the collecting pipe the wort is carried to the wort-pan.

The *sparging apparatus* is a very simple affair. It serves for pouring the water for the after-mash upon the grains, and consists of a vessel suspended by a rope over rollers which leave it free to turn around its axis. A copper pipe is placed on both sides of this vessel, and each pipe is perforated with small holes on one side. The sparging water flows into the vessel and out of these two pipes. As the pressure on one side of the pipes ceases, a rotary motion is imparted to the vessel, which continues as long as water is admitted, which pours in a fine spray over the grains.

The grubbing-machine serves the purpose to loosen the entire depth of the layer of grains and to mix them thoroughly without requiring too much power. It generally consists of horizontal revolving shafts with hooks, knives set like shovels, horizontally placed knives, etc., moving in different directions horizontally, and thus accomplishing the work.

An opening is left on the side of the clarifying tun for throwing out the grain, and thus save the time and labor required in throwing it out over the edge of the tun. This opening is closed by a slide, which, when pulled up, allows the grain to fall through a shute either to the loading place or directly upon the wagons which remove it.

The *wort-pan* is the vessel used for boiling the wort with hops. As larger quantities of fluid always have to be boiled in the wort-pan than in the mash-kettle, it is made shallower. The modern wort-pan is made square and the bottom bent inward. The discharge-pipe for the boiling wort is either closed by a slide-valve, or by a cock if the pan is small. The wort-pan is proportioned in size, in the ratio of 1·5 to 1, relative to the quantity of beer to be produced by one brewing, as a great deal of water evaporates during the boiling of the wort. The hop-strainer is a part of the wort-pan, and is placed immediately under the discharge-pipe. A copper pipe conducts the wort from the lowest point of the hop-strainer to the wort-pump.

There are usually two pumps in a properly constructed brew-house—namely, a mash-pump and a wort-pump—although where brewing is not carried on very extensively one pump sometimes suffices. Two kinds of pumps are used in brew-houses—piston pumps and centrifugal pumps. Piston pumps for this purpose are generally constructed entirely of brass, and are then very expensive fixtures. The valves are either balls or cones of brass fitting closely upon ground brass seats. The centrifugal pump is the one to which largely the preference is given now in breweries. It has proved more effective in service than the piston pump. The objection to it, however, is that it breaks up the mash too much. As the breweries in the United States, however, with very few exceptions, use the *infusion method* for the mashing process, the brewing vessels are placed in such a manner that the mash-tuns stand over the kettle, and the worts run into the kettle by their own gravity, without the assistance of a pump. Small steam-pumps are placed beside the mash-tuns, and are used for the purpose of pumping wort, which runs off feculent at first, back to the mash-tun.

Having described the fixtures of the brew-house, their use in the different processes will be readily understood.

The *mashing process* consists in pouring the malt into cold or somewhat warmed water, mixing it by stirring, and then gradually raising the temperature of the mixture to 167° Fahr., but not above it, because the diastatically acting albuminous substances lose their starch-converting ability at a higher temperature. Through the mashing process the soluble constituents of the malt become dissolved, the starch is converted into dextrine and sugar by the action of the diastase, and sugar and starch in solution form the most important constituents of the wort. Mashing is done by two methods chiefly—the *decoction* or *boiling* method, and the *infusion* method. In mashing according to the first method separate portions of the mash are boiled in mash-coppers, and the temperature of the whole mass is gradually raised to about 167° Fahr. by bringing the boiling-hot mash back to the mash in the mash-tun. The second, or *infusion*, method consists in raising the temperature of the mash by hot water and steam, without boiling any portion of the mash. It is principally in use in England, Holland, and America. The time required for it is less than in the decoction method, and there is also less water required for it, because no evaporation in consequence of boiling takes place.

After mashing off, the wort is brought into the clarifying tun, and remains there at rest. If the mashing process has been correctly conducted, the fluid will, soon after coming to rest, assume a marbled appearance. This is a sign that the separating of the wort from the grain is taking place. The mash is allowed to remain at rest only until the grains have settled. It must be carefully guarded against cooling while at rest as well as during clarifying. For this reason steam is admitted between the double bottoms. When the separation between wort and grain is completed, and the former runs no longer off feculently, the cocks in the copper pipes in the bottom of the clarifying tun are opened and the wort allowed to run into the wort-pan. The wort need not run off quite clear, but care must be taken that it should not have a milky appearance.

When the wort-pan has been sufficiently filled, the pipe leading to the pan is closed and the cocks in the suction-pipes are opened entirely. The thin wort yet contained after the different spargings will run off entirely, and is used profitably for feeding cattle.

The next operation is *the boiling of the wort with hops*. This has a twofold object—first, to separate the coagulable albuminous substances in the wort in an insoluble form; and second, to extract the hops. The common method of boiling is to commence boiling before the last wort is in the pan entirely, and to add the entire quantity of hops at one time. The amount of hops added to our modern beers varies from ½ a pound to 1¾ pounds per every 26·5 gallons. The duration of the boiling is decided entirely by the appearance of the wort. It should be stopped as soon as little flakes of coagulated albuminous substances swim upon the bright wort. The brewer then calls it "broken." The "breaking" of the wort should make its appearance in from one and a half to two and a half hours, but at the utmost in three hours, after boiling has commenced. Infusion-worts, and also worts produced by the addition of raw fruits, must often boil for four hours or more.

In a brew-house fitted up with mash-tun, mash-kettle, clarifying tun, and wort-pan four brewings can be made in twenty-four hours, or at least seven brewings in forty-eight hours by forced work.

Cooling the Wort.—When the wort comes in contact with the air those microscopic organisms always present in the air pass into it, exciting various fermenting processes in the wort, and predisposing it and the beer to be produced from it to spoil. This can take place neither at very high nor very low temperatures, but a medium temperature is favorable to it. Therefore, one of the most important tasks in brewing is to lower the temperature of the wort as quickly as possible from 120° to 40° Fahr.; that is, to bring it to a temperature at which the yeast may be added to excite alcoholic fermentation.

For this purpose the wort is brought into shallow vessels, so-called "coolers," where its temperature is lowered by greater surface-contact with the air. Ice and water are also used for this purpose.

In well-appointed breweries the wort is led in a pipe from the brew-house to the separately located cooling-house. This pipe has as many branches as there are coolers. There must also be pipes for conducting cold water, which should be protected from freezing by covering with some non-conductor. The coolers are made of metal, mostly sheet copper or iron. Lately, cast-iron coolers have come into use to good advantage. The coolers should not rest directly on the floor, so that the air can pass beneath them. A discharge-pipe for the wort and one for the waste water are placed on the lowest point of the cooler. These pipes are closed with brass valves.

The principal fermentation of the wort is the first stage of the fermenting process, which is excited by the addition of yeast to the wort, and progresses in special rooms in the brewery called the fermenting cellars. It demands great attention and vigilance. The fermenting rooms are so located that the wort can be readily brought to them from the coolers, and that the beer can be conveniently forwarded to the storing cellar. It must be as cool as possible, and have good ventilation. For the purpose of establishing a current of air two kinds of openings have to be constructed for the ventilation of the room—pipes leading from the keystone of the arch into the open air, and others passing from the vicinity of the floor through the walls into the open air. These air-vents must be kept well closed from the outside, and should only be opened when the room is to be aired.

The *fermenting vats* of the best kind are open vessels of iron. Galvanized sheet iron or sheet iron varnished on the inside is used in the construction. Recently, cast-iron enamelled vessels have also come into use.

Fermenting tuns constructed of wood are quite generally used, notwithstanding the disadvantages they possess, chief among which is that they cannot be thoroughly cleaned. The best form of such a tun is that of a truncated cone, with the smallest diameter at the top. Every tun has two discharge-holes—one at the bottom, for drawing off the yeast, and closed with a wooden plug extending to above the edge of the tun; and a second one for the drawing off of the beer on the front side of the tun, about two to three inches higher than the usual layer of yeast reaches. This opening is closed from the inside by a short plug or cock. In large breweries, where the beer is brought from the fermenting room to the storing cellar by a steam-pump, it is of advantage to have a wide pipe running beneath the discharge-holes of the tuns, which receives the wort from the separate tuns and conducts it to the pumps.

After the wort has been set with the yeast, the tun is marked with the number of the brewing, the date of filling, the settling temperature, etc.

The brewer judges from the appearance of the beer and by examination with the saccharometer whether the principal fermentation is finished and the beer "ripe" for "racking off"—viz., fit to be brought into the storing (lager) barrel.

If the fermentation has been good, a "covering," dark and smeary on the top, and consisting of a ¾-inch to 1½-inch thick foam, formed of small bubbles, appears on the surface of the fluid, now called beer. If this foam is blown aside, the beer beneath it appears of a dark color. This covering is the principal criterion by which the course of the fermentation is judged.

When the "ripe" beer is to be drawn from the fermenting tun, it is first skimmed off with a flat spoon, then the tun is tapped; the beer flows into a vessel placed under the tun, and from this it is pumped through rubber hose or copper pipes into the storing cellar.

The beer cannot be drank in the condition in which it leaves the fermenting vessel, but must always be stored for a shorter or longer time, either in small casks or large storing barrels, and must pass through a further moderate fermentation, called "after-fermentation," for the purpose of acquiring those properties which will make it a well-tasting and wholesome beverage. The quality of the beer is improved by a long-continued after-fermentation.

The temperature of a good store-cellar should be uniform all the year round; the air in it should be pure and the cellar should be dry. The nearer the temperature approaches the freezing-point the greater will be the certainty of being able to keep the beer unspoiled during the summer. Hence ice is an indispensable article in the fabrication of the beer; and this has led to the almost universal introduction of ice-machines in American breweries.

The steadily increasing consumption of beer in the United States has not only revolutionized the methods of its manufacture, but has also developed it into a most important industry. Competent authorities estimate the yearly consumption of grain and hops in the breweries of the United States at $40,000,000. Before the year 1866 the tax upon fermented beverages was paid in money at the rate of $1 per barrel of 31 gallons. Since then the tax is collected by means of revenue-stamps, on which the brewers are allowed a drawback of 7½ per cent. Every brewer in the United States producing 500 barrels or more has to pay a tax of $100, those producing less than 500 barrels paying $50.

The following statement shows the increase in the production of fermented beverages in the fiscal years from 1863 to 1880:

Year.	Barrels of 31 gallons.	Year.	Barrels of 31 gallons.
1863	1,765,827	1872	8,659,427
1864	3,459,119	1873	9,633,323
1865	3,657,181	1874	9,600,897
1866	6,207,401	1875	9,452,697
1867	6,291,184	1876	9,902,352
1868	6,146,663	1877	9,810,060
1869	6,342,055	1878	10,241,471
1870	6,574,616	1879	11,103,084
1871	7,740,260	1880	13,347,110

According to the last census returns, there were 2741 brewers and 11,610 dealers in fermented beverages in the United States. Of late years also a considerable quantity of bottled beer has been exported, on which the Government allows a drawback equal to the tax. The commissioner of internal revenue calls attention to the steady increase in the consumption of malt liquors, and to the fact that the foreign demand for American malt liquors is also increasing. (A. F. H.)

See Vol. IV. p. 247 Am. ed. (p. 278 Edin. ed.).

BRIBERY. According to Lord Coke (3 *Inst.*, 145), it is bribery at common law "when any man in judiciall place takes any fee, or pension, robe, or livery, gift, reward, or beverage of any person, that hath to do before him any way, for doing his office, or by color of his office, but of the king only, unless it be of meat and drink, and that of small value." The difference between bribery and extortion is, that "bribery is only committed by him that hath a judiciall place, and extortion may be committed both by him that hath a judiciall place, or by him that hath a ministerial office" (*Id.* 147). Mr. Bishop (2 *Crim. Law*, 7th ed., § 85) defines it thus: "Bribery is the voluntary giving or receiving of anything of value in corrupt payment for an official act done or to be done." The constitutions or the statutes of most if not all the States and of the United States make it bribery for public officers, or for certain designated officers, to accept a bribe or for any person to pay or offer to pay the same. Fortunately for the reputation of the country, few cases of this character have ever arisen.

Recent legislation by the general Government and by the legislatures of most of the States, in obedience to public sentiment, as to the bribery of voters and the raising of funds for that object, is so varied that a comparison thereof with a view to the determination of what is best and most effectual would be of high interest. But to make anything like an analysis of the available materials would be obviously impossible within the limits of this work. By a statute of the United States (ch. 287, Aug. 15, 1876, 19 *Statutes at Large*, p. 169, § 6) it is enacted, "That all executive officers or employés of the United States not appointed by the President with the advice and consent of the Senate, are prohibited from requesting, giving to, or receiving from, any other officer or employé of the Government any money or property or other thing of value for political purposes; and any such officer or employé who shall offend against the provisions of this section shall be at once discharged from the service of the United States; and he shall also be deemed guilty of a misdemeanor, and on conviction thereof shall be fined in a sum not exceeding five hundred dollars." Under this statute the circuit court of the United States for the eastern district of New York (Wallace, circuit judge, writing the opinion) has recently held, in the case of the United States against Curtis, that an officer or employé of the United States of the prohibited classes who received contributions for political purposes was guilty of a misdemeanor, and punishable as provided by the statute, which was held to be constitutional. The case being removed into the Supreme Court of the United States, the decision below was sustained (106 *U. S. Rep.*, 371). The Revised Statutes of the United States (§§ 5506–8) prohibit and punish the hindering, delaying, preventing, or obstructing any citizen from doing any act required to be done to qualify him to vote, or from voting at any election; they also provide that every person who prevents, hinders, controls, or intimidates another from exercising or in exercising the right of suffrage, to whom that right is guaranteed by the fifteenth amendment of the Constitution of the United States, by means of bribery or threats of depriving such person of employment or occupation, or of ejecting such person from a rented house, lands, or other property, or by threats to renew leases or contracts for labor, or by threats of violence to himself or family, shall be fined not less than five hundred dollars or be imprisoned not less than one month nor more than one year, or be punished by both such fine and imprisonment; also, that if two or more persons conspire to injure, oppress, threaten, or intimidate any citizen in the free exercise or enjoyment of any right or privilege secured to him by the Constitution or laws of the United States, or because of his having so exercised the same; or if two or more persons go in disguise on the highway or on the premises of another, with intent to prevent or hinder his free exercise or enjoyment of any right or privilege so secured, they shall be fined not more than five thousand dollars and imprisoned not more than ten years; and shall moreover be thereafter ineligible to any office or place of honor, profit, or trust created by the Constitution or laws of the United States.

The power of Congress and the validity of such legislation were passed upon by the Federal courts in United States *vs.* Reese (92 *U. S. Rep.*, 214), United States *vs.* Cruikshank (92 *U. S. Rep.*, 542, affirming 1 Woods, 308), and Seeley *vs.* Knox (2 Woods, 368).

Under the constitutions or the statutes of several States the courts have held that an offer by a candidate for an office to discharge the duties thereof at a salary less than that fixed by law, to cover a portion thereof into the treasury, or to apply a portion thereof to the payment of expenses which the constituency is required to meet, is bribery of the electors and invalidates the election of such candidate.

For the purpose of this article an election may be defined to be the choice, selection, or appointment of any public officer, agent, or servant at any time and place fixed by general, special, local, or municipal authority, whether such choice or appointment be made by the qualified electors or by any member or body of public officers.

An elector is defined to be any person who shall be entitled to vote, or who shall vote, at any such election. Bribe or bribery to be reward, benefit, or advantage, present or future, to the party influenced or intended to be influenced, or to another person at his instance, or the promise of such reward or advantage. Any person shall be guilty of bribery of an elector who shall directly or indirectly give, offer, or promise to, any elector any bribe. Any elector who shall accept or agree to accept a bribe shall be guilty of an offence, and be punishable in the same manner and to the same extent as if guilty of bribery.

The provisions of the constitutions and statutes before mentioned make the following, among others, offences against election laws: By any corrupt means influencing, or attempting to influence, any elector in giving his vote at any election. By any corrupt means disturbing, restraining, or hindering any elector from giving his vote at any election, or in the free exercise of any right of suffrage at any election. The furnishing of any entertainment to any elector previous to or during any election, or paying for, furnishing, or engaging to pay, moneys, property, or other valuable thing for any such entertainment or the furnishing thereof. The furnishing or engaging to pay or deliver any money, property, or other valuable thing for the purpose of inducing any voter to stay away from any election or for the purpose of procuring the attendance of an elector or electors at any election, except for the conveyance of electors who are sick or infirm. The furnishing, or engaging to pay, or delivering, or causing to be paid or delivered, any money, property, or other valuable thing for any purpose intended to hinder, prevent, or defeat or to promote the election of any candidate or candidates, or any question, at any election, except for the fair and reasonable expense of holding and conducting public meetings for the discussion of public questions, of printing and circulating ballots, slips, or pasters, hand-bills, and other papers previous to such election, and advertising in the newspapers. Directly or indirectly furnishing any money or other valuable thing to be illegally used at any election. An offer, promise, or agreement to induce any other person to endeavor to induce any officer, or person to be elected to any office, to give or appoint any person to any office, place, or employment in order to influence any elector at an election. An offer, agreement, or promise to appoint or procure the appointment of any person to office, preferment, or employment, with intent to influence any elector to vote for any person at an election, or to induce any person to procure, or aid in procuring, the election of any person at an election. Any person communicating such offer, agreement, or promise to any person with intent to induce, or have any person induce, any elector to vote for any person at an election, is guilty of bribery; and so is any person who shall directly or indirectly treat with any elector with intent to influence him in giving his vote at any election.

Bribery further includes the lending or agreeing to lend any money, property, or other valuable thing with intent to influence any elector in his vote or action at an election. An offer by a candidate to the electors at any election or a portion of them to discharge the duties of his office or employment at less than the legal rate, and to appropriate the remainder thereof, or to allow the same to be appropriated, to any public place or charity, is held to be bribery. Any attempt to influence an elector at an election by any threat of withdrawing or withholding custom or dealing in business or trade, or of bringing any suit or criminal prosecution, or of enforcing a debt, or any other threat of injury or oppression, is bribery. Any person who attempts, in any way, or by any means, to influence any operative or person in his employ, by threats of withholding from him any office, place, or employment, or dismissing him from office, place, or employment, or by promises of office, place, or employment, or threats of reducing his wages, is also guilty of bribery, and is liable to its penalties.

The offence includes also cases like the following: The advancement or payment, or the causing to be advanced or paid, any money or other valuable thing to, or to the use of, any other person, with the intent that such money or other valuable thing, or any part thereof, or of the proceeds thereof, shall be illegally expended at or during any election; or the knowingly paying, or causing to be paid, to any person any money or other valuable thing in discharge or repayment of any money or valuable thing wholly or in part illegally expended at any election. Any person who shall fraudulently or deceitfully change, alter, or falsely represent a ballot, or attempt so to do, or cause any deceit to be practised upon an elector with intent to induce such elector to deposit the same as his ballot, may be held to be guilty of bribery. So also is any person who shall, by fraud, intimidation, or other wilful and corrupt violation of any election law of the State, influence, or attempt to influence, any elector in giving his vote, or to awe, restrain, hinder, or disturb him in the free exercise of the right of suffrage. Any person who shall knowingly induce, or attempt to induce, any person to vote, or to permit any person to vote, illegally at any election, is equally guilty of the offence; and so also is any person who shall knowingly induce, or attempt to induce, any election officer, clerk, or canvasser to improperly or illegally discharge the duties of his office or to do any improper or illegal act.

An attempt to do, or procure the doing of, any act forbidden by the election laws, is usually declared to have the same effect, and to be punishable in the same manner and to the same extent, as the actual doing, or procuring the doing, of such act.

Any elector accepting or receiving from any person whomsoever any bribe, money, property, or other valuable thing, or any illegal inducement for voting, or as an inducement to vote, for or against any person or persons at any election, or for staying away from any election, is liable to be punished for bribery, as well as any person who shall receive money or other thing of value to be used for the purpose of procuring or influencing a vote or votes.

In some of the States any person guilty of a violation of its election laws is declared to be guilty of a criminal offence, to forfeit the office to which he was elected, and, on conviction of such offence, to be disqualified from holding any office of profit or trust in the State for a term of years or absolutely, and to be punishable by a fine or imprisonment, or both. In some States any person guilty of an offence against the election laws thereof on conviction forfeits the privileges and rights of an elector, and the right to hold office, for a specified time, and in some absolutely.

Man has never realized a Utopia. Laws which involve his highest and most important interests should, however, be as just and as perfect as possible. If such laws are enforced, justice will thus be done. If not, the fault is not in the law, but in its enforcement. If defective, enforcement is useless and ineffectual. A good law is more likely to be obeyed, and is more easily enforced, than a poor one. The fact that man has become more cultivated, and that his views of morality and public good have advanced with his civilization, should be as quickly recognized in his laws as elsewhere. No remnant of antiquity not consonant with the public interests should be allowed to stand in the way of such interests for a moment.

The following are suggestions regarding the points under discussion. Election laws should obviously recognize the following principles:

First. The public interest demands that every public office be filled by an honest, capable man.

Second. That he should be fairly and honestly elected.

Third. Though part of the electors honestly voted for the candidate, if any considerable part did so from dishonest and corrupt motives, no matter how honest and capable such candidate may be, he is not fairly and honestly elected.

Fourth. If the candidate be guilty, either directly or indirectly, by connivance or otherwise, of any dishonest or corrupt practices, such conduct establishes beyond question that he is not honest and ought not to be allowed to hold office.

Fifth. One elected to an office has no personal interest therein. He holds it simply as the agent of, and for the benefit of, the public.

Sixth. If the election, from the manner thereof or for any cause, be not conducive to the public good, the incumbent should not be allowed to hold the office.

Seventh. The question whether an election was properly conducted should be decided by a court or some designated body or tribunal.

Eighth. A partisan body, political or legislative, in nine cases out of ten decides a case upon purely partisan, political grounds, and therefore such a body should not be allowed to decide upon the election of its own members. This practice is a remnant of antiquity which should be abolished. The election of members of such bodies, if contested, should be decided by the courts, which are, as a rule, far removed from partisan and political bias. The necessary constitutional amendments should be made. Politicians could not, and dare not, obstruct or prevent the work if its necessity were understood by the people.

Ninth. Cases of disputed elections should be decided by the courts without jury. There is then no danger of the disagreement of a jury by division according to political bias or from being reached or affected by politicians or interested parties.

Tenth. Such cases should be promptly and summarily tried and decided. The parties should be required to speedily present the issues; the court should be convened as soon as possible; the trial should at once proceed, and the court be required to render its decision within a brief, specified time.

Eleventh. The successful party should be at once entitled to the office, and should not be delayed by any appeal, management, or tactics of his adversary.

Twelfth. Such cases involving the highest public interests, an appeal should be allowed to the courts of last resort. They should have a preference in all courts over all other business, and should be required to be decided by the courts within a specified time. No change in the person holding the office should be allowed during the appeal, but on decision of the final appeal the party held to be entitled thereto, if not in office, should be entitled at once to qualify and enter upon the discharge of its duties.

Thirteenth. Resignation should not be allowed to prevent the impeachment, trial, and conviction of one who has been guilty of malversation in office. Such an officer should not be allowed, by his own act, to escape presentment, trial, and conviction and the usual disgrace and punishment.

Fourteenth. The duty of criminal presentment and trial of an officer impeached or indicted should be made mandatory upon prosecuting officers, and they should be made liable to removal from office for failure to discharge such duty.

Fifteenth. In criminal prosecutions for a violation of the election laws every person except the defendant on trial should be, by the statute, made a competent witness and compellable to give testimony; but no testimony so given should ever be used against the party giving it. In case the court certifies that the witness testified fully and fairly on such trial, he should be exempt, and be discharged, from all liability for prosecution for the offence as to which he testified or growing out of the same. (N. C. M.)

See Vol. IV. p. 249 Am. ed. (p. 279 Edin. ed.).

BRICKS. All clays are not equally well adapted for making bricks, and too much care cannot be taken in the selection of suitable materials. Pure clay will crack in drying: plastic clays, containing a small percentage of sand, give the best results, but if the pit contains much water and micaceous sand it will not answer. Neither can clay be used which contains any considerable quantity of silex in the shape of pebbles. The clay should always be tested practically before erecting an expensive plant. Good results may sometimes be obtained by a proper admixture of clay and sand. Fire-brick clays should be free from lime, magnesia, potash, and those metallic oxides which act as fluxes.

Moulding.—The old method of moulding the tempered clay by hand directly from the pug-mill is laborious and expensive, and in many localities where bricks are extensively used has yielded to more expeditious and economical methods by machinery. The earliest efforts in the use of brick-machines were made to compress the "dry clay," but after an experience of nearly twenty years they were superseded by the machines using the "tempered-clay" process. Of these there are numerous patents, under which the blocks of clay are formed and compressed by toggle-joints, screws, and levers or their combinations. All these machines may, however, be divided into two general classes: (A) those in which a continuous stream of clay is forced from the pug-mill and subsequently cut into proper lengths by a knife or wires moved across the bar of clay or by helicoidal blades moving so as to make a smooth transverse cut across the slab; (B) those in which the clay is expressed into moulds moving under the nozzle of the mill. This latter class may be subdivided into six varieties, based upon the arrangement of the moulds. Thus, (1) the mould-wheel, bearing moulds which may be filled and discharged by various devices, may revolve in a horizontal plane. (2) The moulds may be placed on the surface of a wheel or cylinder, and, revolving on a horizontal axis, may receive their charge from a mill or hopper above. (3) There may be two wheels bearing moulds, in which the pressure is derived from the contact of the peripheries upon each other, the hopper being placed over the angle between the horizontal cylinders. (4) There may be a series of moulds linked together so as to form an endless belt, which passes under the mill. (5) The clay may be moulded by a reciprocating piston. (6) The moulds themselves may be made reciprocating. Each of these varieties has its special advantages.

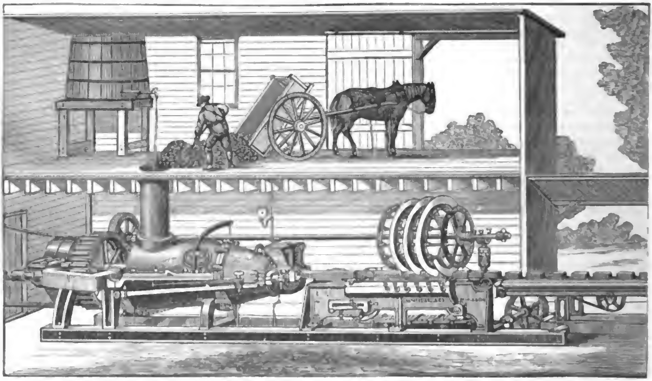


FIG. 1.—Chambers Machine.

An ingenious example of class A may be seen in the machine of Messrs. Chambers Bros. & Co. of Philadelphia, Pa. (fig. 1), which consists of a strong horizontal receiver, cylindrical for a short distance and then tapering to a die-holder, held on its end by a hinge and hook bolt so as to be readily swung to one side. In the cylinder a shaft revolves having narrow knives projecting radially from it and arranged helically around it. On this same shaft, and in the small end of the cylinder, is the pressing screw, which consists essentially of a cone, with a continuous spiral thread or blade wound around it, like the ordinary gimlet-pointed wood screw. The clay is shovelled into the hopper of the machine without any previous treatment except the addition of a little water. The hopper is circular, larger at the bottom than at the top, and enters the large end of the cylinder to one side of the centre line, so that the clay in falling meets the revolving knives as they are coming up. This keeps up an agitation of the clay in the hopper and tends to prevent any clogging or irregularity of supply. The knives break up the clay and thoroughly mix it into a homogeneous mass, and at the same time urge it forward to the pressing screw. This screw is smooth, while the chamber in which it revolves is fluted, so that the clay is treated like a nut and forced forward, being at the same time compressed in the gradually diminishing space. At the point of the screw the clay enters the die-holder, which is contracted at the sides and enlarged at the corners, so as to secure uniform density and sharp corners to the stream of clay issuing from the die. The die is made of chilled cast iron, and can be quickly replaced when worn. Its orifice has the shape of the end of a brick, but is enlarged at the angles (as shown in figs. 3 and 4) to prevent the formation of serrated edges by retardation of the stream of clay. The die is also made hollow to admit of the passage of steam, and by this the flow of the clay is much facilitated (see fig. 2).

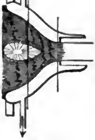


FIG. 2.

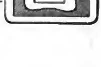


FIG. 3.

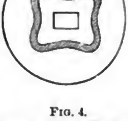


FIG. 4.

A curious effect of this pressure on the clay while it is in motion is that the particles arrange themselves with the coarser ones in the centre of the stream, and the finer at the surface. This was clearly shown by the fractures of burnt bricks.

In the earlier machines of this pattern the stream of clay is delivered on an endless belt and carried forward to the cutting-off wheel, which has a thin narrow blade of steel projecting from its circumference, arranged to cut off a brick-length at every revolution of the wheel, the speed of the stream governing the speed of revolution. It is found, however, that the bricks vary slightly in length; that the blow given by the blade slightly depresses the surfaces at the edges left by the cut; and that the ends of the bricks often appear cracked. With the new cut-off the stream of clay is delivered on an endless bed made up of jointed plates, each the length of a brick, with narrow spaces between them to permit the passage of a continuous steel blade wound helically around a large cylinder. The projection of this blade from the cylinder gradually increases, and its pitch is the length of a brick; so that when the cylinder revolves the blade will cut the stream of clay into lengths which cannot be greater than its pitch, and can be less only when the speed of revolution is too fast relatively with the speed of the stream. The coincidence of these speeds is ingeniously accomplished by using the pressure of the stream against the blade as a means of governing the speed of revolution. Arrangements are made to prevent any damage from the accidental presence of stones in the clay. After the bricks are cut off they are carried on an endless belt under a dusting-machine, to put them in better condition for handling and to improve the surface when burnt. They are taken from this belt by hand, and pass through the usual process of hacking, drying, and burning without being first laid upon the drying floor.

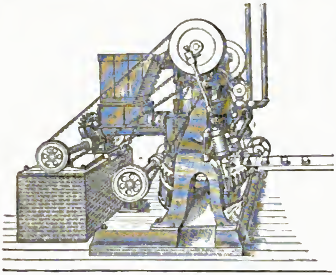


FIG. 5.—Morand Machine.

A typical machine of the class B, first variety, is that of Augustus Morand, a clay-tempering and moulding-machine (fig. 5) consisting of two pug-mills, a horizontal revolving mould-board, and an "off-bearing" belt. The operation is thus described by Gen. Gillmore in his exhaustive report upon the brick-making machinery at the Centennial Exhibition of 1876: "The clay and water are put into the horizontal mill, where the spirally set knives mix and temper the material and force it forward to the delivery end, where it descends into the vertical mill. This is also provided with helicoidal arms or knives. Under the mill, and in contact with its lower end, revolves with a uniform continuous motion the horizontal mould-table containing eight moulds at equal distances from each other and near the periphery. The mixed and thoroughly tempered clay is forced downward through a slot in the bottom of the mill, thus filling the moulds in succession as they pass under this slot. Each full mould then passes under a pressure-plate, which confines the clay on top, while a movable plate, which fits into and closes the mould at the bottom on the under side of the table, is forced up by passing over a cam. This compresses the plastic brick, and ejects the air and excess of clay through a small circular aperture in the pressure-plate provided for that purpose. After passing the pressure-plate the bricks are thrust up to the top of the mould-table by another cam, and are pushed off automatically to an off-carrying belt. They are taken from this belt and sanded, hand-pressed, put on cars, and conveyed to the drying ovens, all within the space of a few minutes after the crude clay is introduced into the mill.

"The characteristic merit of the Morand machine—due to the double pugging which the clay receives—is the high degree of homogeneity and plasticity which it confers upon the bricks. In these respects it possesses in a superior degree all the advantages of the best expressing-machines, without sacrificing the greater accuracy of form and smoothness of edges which a well-moulded brick always has over one cut from a plastic bar. A component part of the machine is a driving-engine consisting of two inclined cylinders each 8½ inches in diameter and 12 inches stroke, with all the necessary connections. A roller-mill for disintegrating the clay should be placed in the bottom of the hopper directly over the horizontal pug-mill. The Morand machine can produce from 22,000 to 24,000 bricks in ten hours. Its weight is 9 tons, and its price, with engines, $5000, or without engines $4000."

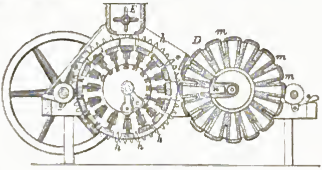


FIG. 6.

The illustration (fig. 6) shows a machine of the second variety, in which the pulverized clay passes from the hopper E into the moulds on the wheel below. The bricks are compressed by the perforated pressing surfaces on the opposite wheel D. As each of these surfaces comes in contact with the clay communication is established with the trunk *n* and pipe *o*, which lead to an air-pump, by which means the air is exhausted from the clay while the latter is under pressure. The superfluous clay falls into the depressions *m*, which also gear into the teeth *h* of the mould-wheel.

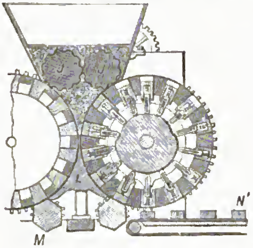


FIG. 7.

The third variety is clearly exemplified by the section shown in fig. 7, in which the corrugated feed-rollers JJ' in the hopper drive down the clay, which enters the moulds on the cylinders. These cylinders are complementary, each one having its moulds and corresponding pressing surfaces. Each mould has its piston or follower, which is moved radially by contact with a cam on its main shaft. As soon as the mould passes the edge of the dividing-block the cam commences to thrust out the follower and reduce the brick to a smaller compass, pressing it against the face of a roller. The concavity thus produced is removed by the facets of the hexagonal roller M. When the mould reaches the lowest position, its follower is still farther advanced and discharges the moulded brick upon the off-bearing apron N'.

The fourth variety is exemplified in the endless-belt machine. This machine consists of an endless chain hinged together and running over two sprocket-wheels. This chain carries the moulds, which are provided with movable bottoms, by motion of which the clay is compressed and the bricks forced out at the proper time. The machine combines a pug-mill, a chamber from which the clay is ejected by arms, boxes containing the moulds, and a toggle moving a plunger operating against the bottom of the mould. There is a discharging-wheel, the spokes of which lift the bottom of the mould and discharge the bricks.

The fifth variety is found in the Durand and Marais machine, made in Paris, France (fig. 8). It turns out but one brick at a time. The pressure is applied by a cam of such shape as to cause (1st) the bringing together and closing up of the materials to be compressed; (2d) a short but very powerful compression; and (3d) the expulsion of the finished brick or block. The material should be partially dry, such as clay directly from the bank or coal-dust with just sufficient tar to produce cohesion under pressure. This machine does not produce what is styled a plastic brick. It can turn out from 9000 to 10,000 bricks in ten hours, and its price is $750. It is strong, simple, easily kept in working order, and requires only a small motive-power to move it.

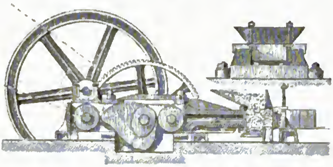


Fig. 8.—Durand and Marais Machine.

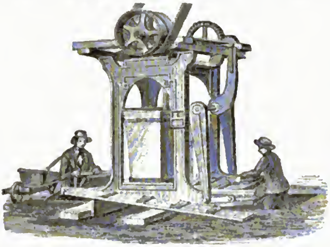


Fig. 9.—Smith Machine.

As an example of the sixth variety we may cite the machine patented by F. H. Smith, July 9, 1868, which is as follows: The clay taken from the pit is passed through a pulverizer into a tank, where it remains over night to soak in water. To secure this end the tank is divided into two compartments, which are used on alternate days. From this tank the tempered clay is thrown into the machine (fig. 9), under which is placed a mould for six bricks. The clay is compressed into the mould by a large screw carrying a broad flange at its lower extremity, which flange moves within half an inch of the bed-plate, thus scraping the clay into the open moulds, and at the same time compressing it to such an extent as to enable the bricks to be handled immediately without setting in the moulds. The capacity of this machine is 54 bricks per minute, or about 30,000 per day, and "the cost of bricks unburned $1 per M, and ready for delivery less than $3 per M." The dimensions of the bricks made in this machine are 9 × 4⅜ × 2½, containing 98·44 cubic inches, which is about 33 per cent. larger than the ordinary size made in the Eastern States. One of the oldest brick- and tile-machines is that of Mr. C. Schlickeysen of Berlin, Germany, which consists of a horizontal pugging-mill with double driving-gear surmounted by a water-box, a disc, and a cutting-table. The machine can be used in connection with a chilled-iron roller mill and an elevator when desired. One machine will make either solid or perforated bricks, tiles, or cornice-bricks. Prices vary with sizes from $215 to $2050; capacity, 5000 to 30,000 bricks in ten hours.

A simple form of *dry-clay machine* is that of I. H. Garretson of Keokuk, Ia. It resembles very closely an ordinary stamp-mill, in which the rammers or stamps are raised by cams revolving on a horizontal shaft and falling into moulds under the iron shoes. The dry clay, after being ground or broken up finely, is fed into the moulds by an intermittent motion which is suspended while the stamp fills the mould. When the latter is full the compressed clay is removed and passed under a sizing-knife to reduce it to the proper dimensions. Six stampers, costing $300, will make 18,000 bricks in ten hours, requiring but a small engine to run them. The bricks are said to be very heavy and compact, but are quite brittle and do not resist well the action of frost.

The machine of George S. Tiffany of London, Canada, is a horizontal expressing pug-mill, embodying the novel feature of two 2-bladed screws behind the die, revolving in opposite directions. The design of the machine is shown by the drawings. Fig. 10 is a perspective view; fig. 11, a central longitudinal section, taken vertically. The pug-mill shaft (fig. 11) is armed in the usual manner with spirally-set tempered knives (of which only a few are represented), and with a two-bladed screw L, fixed about 15 inches in rear of the forming-die C. Between this screw and the forming-die is another similar screw N, carried by a shaft working within the mill-shaft. It revolves about six times as rapidly as the mill-shaft, and in an opposite direction, the objects being to reduce the strain on the mill-shaft and to confine the pressure by which the clay is forced through the die more nearly to the area of the die. The gear-wheels are on the driving-shaft, to which motion is given by the band-wheel U, fig. 10. The device for cutting off the bricks from the bar as it issues from the die is shown in figs. 10 and 11. The bar is first received upon the carrying-band P, and thence passes to the rollers on the rack of the cutting-table. The rack rests on rockers r r, which permit it to have a reciprocating motion to and from the forming-die, and is provided with a cutting-frame H pivoted at e, fig. 11, armed with small wires *e e* for severing the bar into bricks. This machine will easily make 14,000 to 15,000 bricks in ten hours, and can be pushed to 20,000. It will make tiles equally well, and is highly commended by those who have used it. Its price, with one die for common bricks, is $400 at London, Canada. It has a good reputation, and possesses in a high degree the important qualities of strength and simplicity.

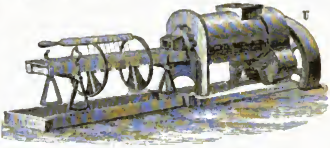


Fig. 10.—Tiffany Machine.

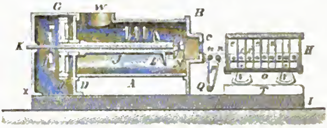


Fig. 11.

Burning.—The methods of burning vary with the form and size of the kiln and kind of fuel used. The earlier kilns were rectangular, and the bricks were set so as to permit a free circulation of heat. The fire-chambers were arranged in parallel pointed arches, whose axes were perpendicular to the sides of the kiln. The fire was started gently near the outer walls and worked in gradually to the centre, care being taken not to force it too rapidly and thus crack the bricks. By another method the draught was arranged to come from the centre and work outwardly. In still another it passed up a central flue and down through the bricks arranged around it, and thence went to a chimney or drying-house. In this case the kiln was annular. In England bricks are also burned in *clamps;* that is, in piles without protecting walls, when the fuel—peat, fine coal, heath, etc.—is arranged in layers between courses of bricks.

The time of burning varies from four to six or seven days, and the amount of fuel from ¼ to ¾ of a cord of wood or its equivalent to the thousand.

After the bricks are burned (which is determined by the amount of settling which has taken place) the kiln must be allowed to cool very slowly; and especial care should be taken to lute up the doors of the fire-chambers and ash-pits, as well as any other openings that may exist, since a current of cold air would injure, if not wholly destroy, the bricks with which it might come in contact.

Classification.—Bricks may be classified according to shape, density, methods of manufacture, position in kiln, color, and purpose. *Arch* brick usually means the partly or wholly vitrified product of the arches forming the fire-boxes of the kilns. A *burnt* brick is wholly vitrified. A *compass* brick is one shaped like a truncated wedge or voussoir. A *capping* or *coping* brick is one used for the upper courses of a wall or for a coping. *Clinker*, a brick from an arch of the clamp, so named from the sharp, glassy sound when struck. A *feather-edged* brick, one of prismatic form for arches, vaults, niches, etc. *Fire-bricks* are made of materials free from lime, magnesia, and potash, and from those metallic oxides which act as fluxes. *Hollow* bricks are such as contain open spaces for ventilation or warmth. *Stocks*, a name given by makers to various grades, as gray stock, red stock. *Pecking*, *place*, *sandal*, *salmon*, *samel*, etc., are local terms applied to imperfectly burned or refuse bricks. The expression *air-brick* denotes a grating let into the wall for ventilation.

Measuring.—Brick-work is generally measured by the thousand bricks laid in the wall, but sometimes by the perch. There are various methods of estimating the number of bricks in any given work, and the conventionalities adopted in the several sections of the country are known as "constructive measurements." The general practice is to allow a certain number of bricks to each square foot of wall-surface, the number varying with the thickness. The figures generally accepted are—for a 4½-inch wall, 7 bricks per square foot; for a 9-inch wall, 14 bricks; for a 13-inch wall, 21 bricks; and so on in multiples of seven for each half brick added to the thickness. It is customary in brick walls to deduct all openings for doors, windows, arches, gateways, etc., but not for flues, ends of joists, trimmers, or girders, nor for the boxes of window-frames, nor any sills or lintels, account being taken of the extra labor in setting and the waste in laying.

To find the number of bricks required for a wall of given dimensions, allow one-tenth of the volume for mortar and deduct all apertures. Brick-work in tunnels and arches is usually measured by the cubic yard. It requires 38 bricks, 8¼ × 4 × 2, with joints from ⅛ to ¼ inch wide, to lay one square yard if placed flat; if on edge it will take 73, and on end 149. Bricklaying, including mortar and scaffolding, will average for an entire dwelling $8 per *M.* The best pressed bricks in first-class work will cost from $15 to $20.

Sizes of Bricks.—In Cuba the moulds are said to be 11 × 5½ × 2⅝ inches; contents, 159 cubic inches; in South America, 12¾ × 6¼ × 2½, or nearly 200 cubic inches. The British standard size, as fixed by law, is 8¾ × 4⅜ × 2¾ inches, which gives a volume of 105¼ cubic inches. In the United States the sizes vary considerably, the average being about 8½ × 4 × 2½, containing 85 cubic inches, or twenty bricks to the cubic foot, whilst a cubic yard is assumed to contain 600 instead of 540, and a perch of 22 feet is reckoned as 500 bricks laid in the wall. In the Eastern States a common size is 8¼ × 6 × 2 inches (= 98⅝ cubic inches), which is less than ⅝ the size of the Cuban brick. In some places 8 × 2¾ × 1¾ is not an unusual size; it contains only 38½ cubic inches. Stock or place bricks commonly measure 8¾ × 4¼ × 2¾ inches, and weigh from 5 to 6 pounds each. Paving bricks should measure 9 × 4½ × 1¾ inches, and weigh from 4 to 4½ pounds. Of this size 1 yard of paving requires 36 bricks laid flat, or 82 on edge. Of stock bricks 52 will be required if laid on edge. A good hand-moulded brick of 8¼ × 4 × 2 will weigh about 4½ pounds, or 118 pounds per cubic foot, or 1·4223 tons per cubic yard, giving 500 to a ton. Machine-pressed bricks weigh about 5 pounds each. The specific gravity of pressed brick is 2·4, giving for the weight of a solid foot 150 pounds; that of common brick varies considerably, but may be taken at 1·894, or 118 pounds per foot; of fire-brick the figures are 2·201 = 137.6 pounds; of brick-work in cement, 1·8 = 1125 pounds, and in mortar the same; of soft brick, 1·6 = 100 pounds per cubic foot. Brick absorbs from $\frac{1}{15}$ to $\frac{1}{7}$ its weight of water.

(L. M. H.)

BRIDGEPORT, a city and seaport, one of the shire-towns of Fairfield co., Conn., on Long Island Sound, at the mouth of the Pequonnock River, which affords a good and commodious haven, somewhat encumbered at the entrance by a bar which has seldom over 14 feet of water. Lat. 41° 10′ N., long. 73° 11′ W. It is on the New York and New Haven Railroad, at the junction of the Housatonic Railroad. The trains of the Naugatuck Railroad also run to Bridgeport. It has a regular passenger-steamboat service to New York. The city has very extensive and important manufactures of firearms, sewing-machines, cartridges, hardware, castings, axles, springs, locks, hats, machinery, carriages, and a great variety of other goods. Many of the streets are beautifully shaded, and the town has a large number of fine houses and churches, including places of worship for all the leading denominations. There are five national and three savings banks, three daily, one semi-weekly, and three weekly newspapers, systems of public and Catholic schools, a city high school, a training school, and a good library, a Catholic academy and convent; also the Golden Hill Academy and a ladies' seminary. Bridgeport has street railways, an opera-house, four public halls, two good hotels, and all of the conveniences of a large city. It is principally built on the west side of the river, that part which lies E. of the river being locally known as East Bridgeport. The city has important fishing and oystering interests. Population, in 1870, 18,969; in 1880, of the city, 27,643; of the township, 29,148. It ranks as the third city of the State in population, and the seventy-first in the United States. The city in 1880 contained 20,204 natives of the United States and 7439 foreigners; 443 persons were of African descent. There were 3735 dwellings, with an average of 7·4 persons to a dwelling. Bridgeport's history does not extend beyond 1821, when the town was organized, the city charter dating from 1836. Its recent growth has been extremely rapid.

See Vol. IV. p. 253 Am. ed. (p. 284 Edin. ed.).

BRIDGEPORT, an incorporated village of Belmont co., Ohio, is on the Ohio River opposite Wheeling, W. Va. It is on the Cleveland and Pittsburg Railroad and the Cleveland, Tuscarawas Valley, and Wheeling Railroad. The Ohio River is here crossed by a suspension bridge, and there are three others over Wheeling Creek. Bridgeport has four hotels, a national bank, five churches, four schools, two flour-mills, two iron-mills, two glass-works, a stove-foundry, planing-mill, machine-shop, and barrel-factory. There are three veins of coal underlying the adjoining country, and extensive coal-works are close to the town. It was settled in 1806 and incorporated in 1836, but has only begun to grow rapidly since 1870. Its property is valued at $850,000; its public debt is $4700, and its expenses for 1881 were $8000. Population, 2395.

BRIDGEPORT, a borough of Montgomery co., Pa., is pleasantly situated on the Schuylkill River opposite Norristown, 16 miles N. W. of Philadelphia. It is the eastern terminus of the Chester Valley Railroad, which connects here with the Philadelphia and Reading Railroad. It has two churches, two hotels, one foundry, three woollen-mills, two paper-mills, and gas-works. There are extensive lime-kilns in the vicinity. Two bridges across the Schuylkill connect this place with Norristown. It is surrounded by beautiful scenery. It was settled about 1760 and incorporated in 1851. Its property is valued at $700,000, and its public debt is $13,700. Many of the inhabitants are of Swedish descent. Population, 1802.

BRIDGES.

BRIDGES may be classified with reference to their materials or their forms. According to the first, they may be of stone, wood, iron, of wood and iron (called "combination"), and of steel. According to the second, they may be classified as truss, arch, girder, suspension, tubular, pile, pontoon, draw, lift, swing, bowstring, etc. They are also designated by the relative position of the grade and other surface passed over as undergrade, overhead, through, half-through or low, and deck; or, with reference to the angle between the intersecting ways of communication, as right or askew. Bridges of special construction are sometimes designated by the name of their patentee, as the Burr, Town, Long, etc. The first method of classification is used in this article, as it conforms most closely with the history of bridges, and also enables us to illustrate the various subdivisions of the second method.

See Vol. IV. p. 253 Am. ed. (p. 284 Edin. ed.).

Until the last half century bridge-building was merely an art which its masters applied in conformity with their common sense, experience, and observation. The materials employed were those furnished by nature, as wood and stone wrought into proper shape, at great expense and with much labor, by hand tools, and put in place by the aid of heavy staging. No effort was made to compute the strength of the several parts of a bridge, but each constructor modelled his design and proportioned his details generally upon the precedents already established. The stone arch and the wooden truss were simply the result of intelligent observation and centuries of practice.

Squire Whipple (1847) and H. Haupt (1851) were the first American writers on the science of bridge-construction. Their methods and researches were conducted independently, and their results have furnished an invaluable basis for the great progress which has of late years been made both in the theory and practice of this branch of the profession.

In England the first purely theoretical writer on this subject was R. H. Bow (Nov., 1850), although data of a similar character had been published in the correspondence of Messrs. Stephenson, Fairbairn, Hodgkinson, and by Kirkaldy and Barlow, who contributed greatly to the development of iron bridge-building through their extensive experiments on the strength of materials in 1845 and subsequently.

Stone Bridges.—Stone bridges may be said to date from the period when man instinctively placed stepping stones in a stream, forming miniature piers in the shallow water. To trace the development of this class of bridges would necessitate an expansion far beyond our limits. We shall therefore merely refer to some of the most important structures of ancient and modern times, and especially since the introduction of railways.

The town of Alcantara ("the bridge"), in Spain, derives its name from the magnificent Roman bridge which there spans the Tagus. It was erected about A. D. 104, in honor of the emperor Trajan, of blocks of granite without cement, and consisted, until its partial destruction, of six arches of various spans. The total length was 670 feet, and height 210. The second arch on the right bank was blown up by the English in 1809, and its temporary substitute was again destroyed in 1836 to prevent the passage of the Carlist troops. At present only one arch, 40 feet high, remains.

It was the practice in some countries to bow the bridge, in plan, up stream, to resist the rush of floods more forcibly. Examples of such structures are found in the bridges of Avignon (one of which, having eighteen arches, was begun by St. Benezet in 1177, and finished in twelve years), St. Esprit, and Lyons, which are convex up stream. The Pont St. Esprit is bowed in many places, making unequal angles, especially where the stream is strongest. Old London Bridge, which was begun in 1176 and required thirty-three years for completion, had nineteen arches and a great pier in the centre, intended for a steadying of the whole structure, instead of making an angle, as in the above-mentioned bridges.

Among ancient bridges mention is made of a bridge of a single arch in the city of Mostar, in Bosnia, much bolder than that of the Rialto in Venice. But these are both excelled by a bridge in China, built from one mountain to another, consisting of one single semicircular arch 400 cubits (600 feet) long and 500 cubits (750 feet) high, whence it is called "the flying bridge." "The stones which form the archivolt are from 7 to 12 feet in length. The voussoirs are intradossed and extradossed from a centre like unto the arches in Europe" (Thomas Pope's *Treatise on Bridge Architecture*, N. Y., 1811). Kircher also speaks of a bridge in the same country 360 perches long, without an arch, supported only by 300 pillars.

The next longest single span of which any record remains was the bridge of Trezzo, built about 1380 by order of Barnabo Visconti, duke of Milan. It was afterwards destroyed by Carmagnola. It consisted of a single arch of granite, very well constructed of stones in two courses; the innermost, 3½ feet thick in the direction of the radius; the outermost, 9 inches. The span at low water was 251 feet, being the longest single-span arch on record, except that in China, of which no very authentic data remain. The rise at the crown from the surface of low water, which was also the position of the springing lines, was 87 feet 9·3 inches. The radius of the segment was 133 feet 0·5 inches. There remains about 24 feet of the arch near the haunches. It is supposed to have been surmounted by a crenellated balustrade terminating in two towers with battlements.

The Horseshoe Bend or Conemaugh Viaduct (fig. 1), built about 1833, is still standing, and is used by the Pennsylvania Railroad Company as a part of its main line. It is a substantial and imposing piece of masonry, about 75 feet high and with a semicircular arch of 80 feet span. The arch is 3½ feet thick at the springing

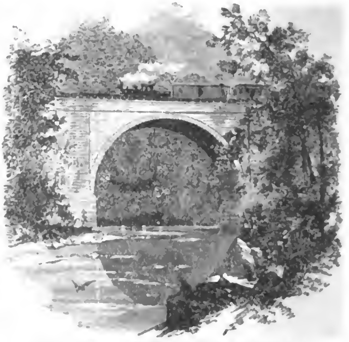


FIG. 1.—Conemaugh Viaduct, Pennsylvania R. R.

une, and 3 feet at the crown; the arch-stones are of light-colored sandstone, and the backing of silicious limestone found near the spot. The sandstone was split from the erratic blocks, often of great size, which were found lying in the woods on the surface of the ground. The contract price for the masonry was $4.20 per perch of 25 cubic feet, and the work was remarkably well done. The face-stones were laid in mortar made from the silicious limestone, without the addition of any sand. The cost of the viaduct was about $55,000. Since the completion of that work iron bridges have in general taken the place of such structures.

The most remarkable structure in *rustic work* (rubble masonry) is a bridge formerly called the Thomas Viaduct, now known as the Carrollton Viaduct (fig. 2), upon which the railroad from Baltimore to Washington crosses the Patapsco at a distance of 8½ miles from the former city. Including the abutments, it has a length of 704 feet 3¼ inches. The crowns of the arches are 60 feet above the level of low water, and if their thickness of 6 feet be added, we obtain the height of the roadway. The parapet is a cast-iron railing. The bridge is curved, being in the form of an arc of a circle of radius 1273½ feet. The arches, however, are truly cylindrical, as the horizontal section of the piers is trapezoidal instead of rectangular. There are eight full centre arches of 58 feet 4 inches span. The thickness of the piers along the short side of the trapezoid, at the springing lines of the arches, is 10 feet. The greater part of this bridge was constructed out of granite from a quarry at a distance of 12½ miles on the line of the railroad. The courses are laid with sufficient regularity. The stones are from 3 to 4 feet long, 1½ to 2 feet wide, and 1 to 2 feet thick. The arches are of a different granite, of a more uniform grain, and without feldspathic crystals. The voussoirs measure from 1 foot 2 inches to 1 foot 6 inches along the intrados, about 2 feet 6 inches in height, and from 3 to 4 feet in the length of the axis of the arch. The foundation is of stone without mortar, all in large pieces. It rests upon the rock, which during the summer is nearly level with the surface of the water. The base of the piers is surrounded by stones of a smaller size (rip-rap). The bridge, including a large retaining-wall at its southern extremity, contains 18,195 cubic yards of masonry, and cost $121,717; thus making the mean cost per cubic yard $6.69. In addition, there were 3713 cubic yards of stone thrown around the foundations of one of the abutments and of several of the piers, costing $5973, thus bringing the total cost up to $127,690. This work, built after the plans of Mr. B. H. Latrobe, architect, of Baltimore, was commenced July 4, 1833, and completed July 4, 1835.

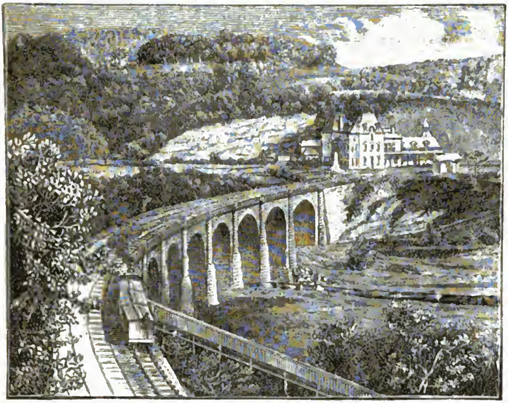


FIG. 2.—Carrollton Viaduct.

The largest existing masonry arch in England is probably that over the Dee at Chester, of 200 feet span and 42 feet rise. The arch-stones at the crown are 4 feet 6 inches deep and 7 feet at the springing.

The largest in America is that over Cabin John Creek, on the Washington Aqueduct, which has a span of 220 feet and versed sine of 57¼ feet, the radius being 134·2852 feet. The height of the crown above the water is 101 feet. The thickness at this point is 4 feet 2 inches, and at the springing 6 feet 2 inches.

One of the longest viaducts of early railroad construction in England is that on the London and Greenwich Railway, which is 3 miles and 60 chains long, laid on more than 1000 arches of yellow brick; 18 feet span, 22 feet high, 25 feet wide. It was opened in 1838, at a cost of $1,300,000 per mile, a large portion of which was consumed in extinguishing title to property.

Another viaduct, on the London and Blackwall Railway, built in the same manner, is 3 miles 38 chains long, and cost $5,419,755.

Two beautiful masonry structures have recently been erected on the Saxon-Bavarian State Railway over the Elster and Göltzsch valleys, of which the following is a brief description: The Elster Valley bridge, situated about halfway between Elsterberg and Plauen (shown in fig. 3), consists of two tiers of masonry, the lower one of which is 110·32 feet high and 550·5 feet long. It contains two double piers, with their included small arches; two cylindrical arches, each of 95·16 feet span; and two retaining-walls. The spans of the small arches are 23¼ feet. The second story, consisting of two double piers and six large arches of 91·43 feet each, has a total length of 918 feet and height of 113·82 feet, making the greatest height above the stream 224·15 feet. The breadth within the parapets is 26·12 feet. This bridge was begun May 31, 1846, and completed July 15, 1851, under the supervision of R. Wilke, consulting engineer, and H. Kell, resident engineer.

The arcade over the Göltzsch valley, erected at the same time, is a still more extensive structure, consisting of four stories, as shown in fig. 4. Its total length is 1900·46 feet, breadth between parapets 26·12 feet. Greatest height above water, 263·58 feet; greatest height above the bed of the foundation, 303·27 feet. The large arch of the lowest story has a span of 94·25 feet, while that of the upper is 101·74 feet. The clear height of the crown of the lower is 136·2 feet, and that of the upper from the deck plane of the lower arch is 104·5 feet. The thickness of the lower arch is 7·8 feet, and that of the upper 7·4 feet.

The span of the smaller arches, which are built open, is 42·0 feet in the lower story. In the second story there are seventeen single piers, in the third twenty-two, and in the fourth twenty-two, and the cost was $1,680,000.

Amongst the most celebrated masonry viaducts in America is that on the Erie (now New York, Lake

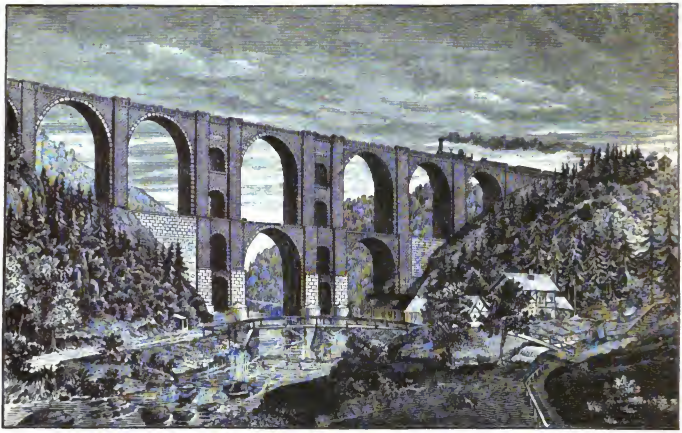


FIG. 3.—Elsterthal Bridge, Saxon-Bavarian State Railway.

Erie, and Western) Railroad, over the Starucca Creek, near its junction with the Susquehanna River. This bridge is 110 feet high and 1200 feet long.

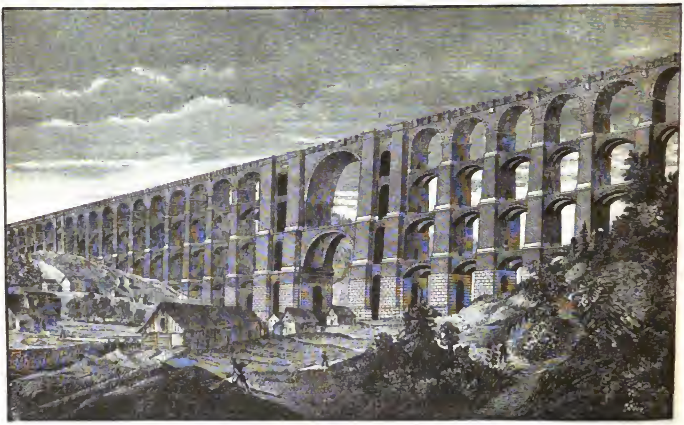


FIG. 4.—Göltzschthal Bridge.

The eastern approach to the South Street Bridge, Philadelphia (built 1872–73), presents some novel features in masonry arches worthy of notice. As the axis of the bridge is inclined to the centre-line of South Street at an angle of 33° 25′, the change of direction was made by introducing three right conoidal arches at the east end (fig. 5). The head-walls are concentric cylinders with radii of 142 and 197 feet, making the roadway, or length of arches and piers, 55 feet from out to out. The piers are rectangular in plan, 55 × 5·5 feet, and 12 feet high. They are of Port Deposit granite, rock-faced ashlar, laid in courses from 17 to 27 inches rise. The centre-line of each pier was located on a radial line of the curve. The spans of the arches are equal, the inner chord measuring 22 feet 1 inch, and the outer 32 feet 9¾ inches, the rise throughout being 11 feet 0½ inch, as the springing line and crown are horizontal. Only the head-walls are of cut stone, the soffit being filled in with brick-work.

One of the best examples of stone-arch bridges in America is that spanning the Wissahickon on the line of the Philadelphia and Reading Railroad, Norristown branch. It is built of talcose slate, and consists of five large, full-centre spans of 65 feet each, and four smaller ones. The grade is 79 feet above the level of the creek.

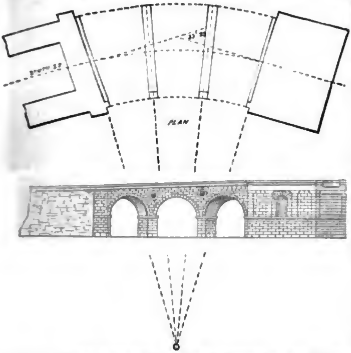


FIG. 5.—Eastern approach to South Street Bridge, Philadelphia, Pa.

The bridge is 492 feet long, 28 feet wide, and contains about 15,000 cubic yards of masonry. It was begun in May, 1881, and completed Dec. 1, 1882, at a cost of about $375,000.

Askew Bridges.—It frequently happens that two lines of communication do not intersect at right angles, in which case the bridge crossing one of them is placed obliquely to the faces of its abutments. Formerly such bridges were generally built of masonry, and those portions of the arches at the acute angles were not resisted and upheld by a corresponding mass of masonry on the opposite side of the arch. This rendered a modification necessary in the bond or form of joints, leading to great difficulty in cutting them normal to the pressures, and also to a waste of material. The English, or Buck's, and the French systems of overcoming this difficulty are explained in the article on ARCH in ENCYCLOPÆDIA BRITANNICA. A simpler method, however, exists, which can readily be executed by any ordinary mason. It consists in dividing the arch into a series of ring courses by planes passed parallel to the end-walls or "heads," and sliding these sections back until the proper angle of obliquity is obtained (fig. 6). Thus they will have the same span and rise, but the bond is less perfect in consequence of the interior soffit being broken, as it were, into steps. As, however, each segment is a *right* arch, and the pressure is normal to the joints and bearings, the advantages are so great that appearance is sacrificed for utility, safety, and economy.

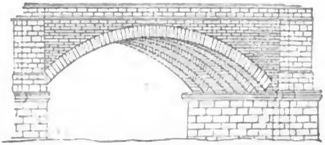


FIG. 6.—Askew Arch on Philadelphia and Reading R. R.

The only instance believed to exist in America of an askew arch with helicoidal joints, as described by Mr. Buck, is that on the Lebanon Valley (now Philadelphia and Reading) Railroad over Sixth Street in Reading, Pa. It was built in 1856–58 by Richard B. Osborn, C. E., under great difficulties, as it was almost impossible to secure masons who could prepare the templates and apply them to the joints. This form of arch is clearly illustrated in fig. 7.

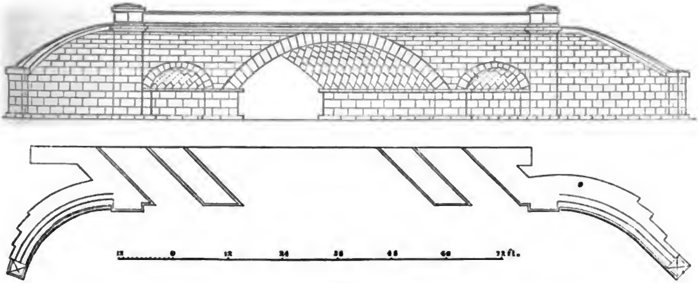


FIG. 7.

The present practice for oblique crossings is to use some form of wooden or iron truss, supported, when possible, upon iron columns and abutments.

The masonry bridge crossing the Schuylkill River on the Philadelphia and Reading Railroad at the Falls of Schuylkill is an example of an askew arch built of segments of circles, as shown in fig. 6. In this bridge there are six arches, each having a span of 83 feet and a rise of 26 feet. The exterior walls are of rock-faced ashlar. There are eight segments in the length of each arch, so "stepped off" in plan that the front edges are on a line, making, with the head-walls, an angle of 21° 30′, which is the angle of the stream with the line of the bridge. It was built about 1854 by J. Dutton Steel, C. E.

WOODEN BRIDGES.

One of the most striking instances of the early application of science to the construction of wooden bridges was that of the famous structure spanning the Rhine at Schaffhausen, erected by Ulric Grubenmann, a common carpenter of Teuffen, in 1758. This bridge, 364 feet long and 18 wide, was destroyed by the French in April, 1799. But this structure, with its two spans, was surpassed in boldness by the one over the Limmat at Wettingen, near Baden, which had a clear span of 368 feet. It was built by the same Ulric Grubenmann.

assisted by his brother John. This also was destroyed in the campaign of 1799. These bridges were remarkable for their originality of design and difficulty of execution, being constructed of many long scarfed timbers. involving much labor and accurate fitting.

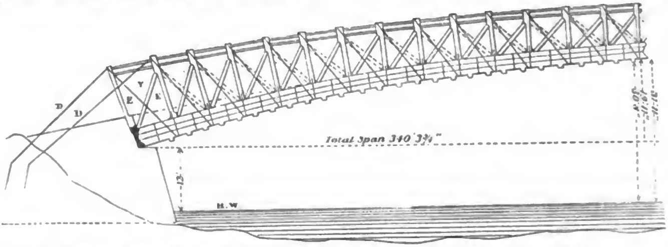
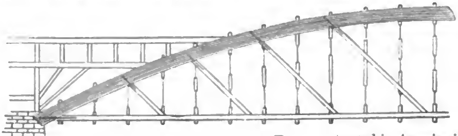


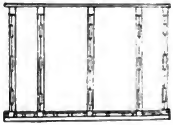
FIG. 8.—Wernwag's Wooden Arch over the Schuylkill River at Fairmount, Philadelphia, Pa. ("The Colossus").

An example of much simpler design for long-span wooden arch trusses may be cited in the bridge erected by Lewis Wernwag in 1812 across the Schuylkill River at Fairmount, Philadelphia. It was 340 feet 3¾ inches in single span, and had a rise of 19 feet 11 inches. The form of this structure is shown in fig. 8. This bridge was destroyed by fire in 1839, after twenty-seven years of service.

In 1804, Mr. Wernwag had built an arch bridge across the Delaware River at Trenton, in five spans of unequal lengths. The centre span was 200 feet long, the two adjacent 180, and the shore spans 160 each. Each truss consisted of a single arch composed of eight planks 4 × 12. The roadway was suspended by chains of 1½-inch square iron, the links of which were about 4 feet long and 5 inches wide, passing through the arches and between the chords and counterbraces, held in place by a key on top of the arch. The floor-beams were suspended below the roadway under the chords, and held up by the suspension chains. The bridge was destitute of lateral braces, the five trusses being connected by the floor-and-roof systems and stiffened by spur struts. (See plan, fig. 9.) This bridge has recently been replaced by a stiffened triangular iron truss bridge (fig. 10).

Numerous other bridges were erected by Mr. Wernwag; at least one of which, known as the Economy bridge, deserves notice for its simplicity. It is shown in fig. 11, representing the half of the longest spans across the Neshaminy Creek, Pa. It was simply a pair of cantilevers supporting a triangular truss. There were three such ribs, connected by cross-ties and bolts. The total span from centre to centre was 80½ feet. This principle will be recognized as an anticipation of the latest form for very long spans.





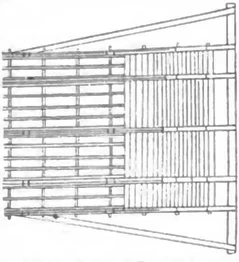


FIG. 9.—Wernwag's Bridge at Trenton, N. J., over the Delaware River.

Among the earliest designs of wooden bridges patented in America is that of Theodore Burr, which was granted Feb. 14, 1806, and improved April 3, 1817. As originally designed, the posts and top chord were single, while the lower chord and arch were in pairs. Subsequently, the posts were doubled, and the chords composed of three pieces both at top and bottom. Iron ties were added between the main braces of each panel to serve as counterbraces. A fair sample of the original structure is shown in fig. 12, representing the Columbia Bridge, across the Schuylkill River near Peter's Island, Philadelphia. It cost about $133,000, and was built in 1834 in three months from the completion of the piers. To compensate to some extent for the increase of strains in the web members, it will be seen that the panel lengths diminish from the centre towards the ends of the bridge. There is, however, a waste of material required by the particular form of post. Recently, cast-iron check-braces have been substituted for the wooden struts shown at *a*, *a*. In some of the bridges of this type the arch is not fastened to the posts, but supports the

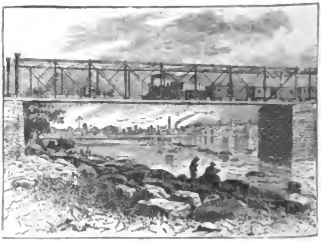


FIG. 10.—Railroad and Highway Bridge at Trenton, N. J., on Pennsylvania R. R.

lower chord by tie-rods passing through saddles over the arch and stirrup-pieces under the chord. This type has long been a favorite for common and railroad bridges.

The form known as the *Town* or *lattice truss* was originally patented Jan. 20, 1820, by Ithiel Town of New York. It consisted mainly of timbers from 2 to 3 inches thick and from 9 to 12 inches wide, depending on the span, placed diagonally and crossing each other at right angles, so as to form a lattice-work, united by two or more treenails at each intersection. There were suitable horizontal string-pieces at the top and bottom of the trellis-work to sustain the floor and roof.

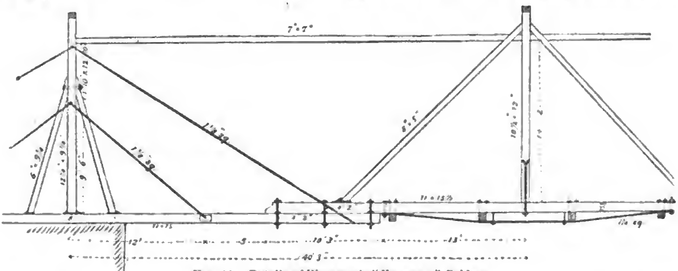


FIG. 11.—Details of Wernwag's "Economy" Bridge.

This design was improved by a patent issued April 3, 1835, for doubling the side-trusses by "the addition of another similar set or series of bracing, of similar kind and dimensions, to be placed in a similar manner, either directly opposite to the former or in any other manner, so as to bring the second tier not opposite to the former, but so that all the intersections of the braces of the latter series shall fall between those of the former braces on the horizontal string-pieces. One, two, or more of these trusses, with a floor and other necessary parts, as usual, will constitute a bridge thus improved" (fig. 13).

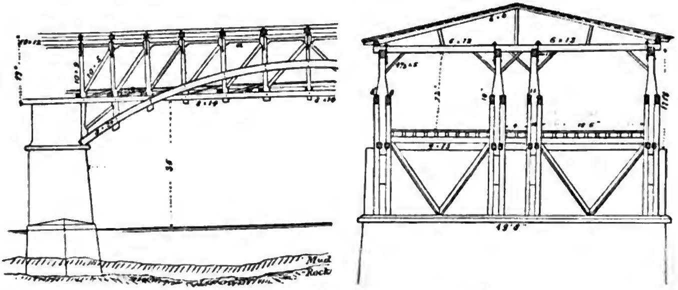


FIG. 12.—Details of Columbia Bridge, over Schuylkill River.

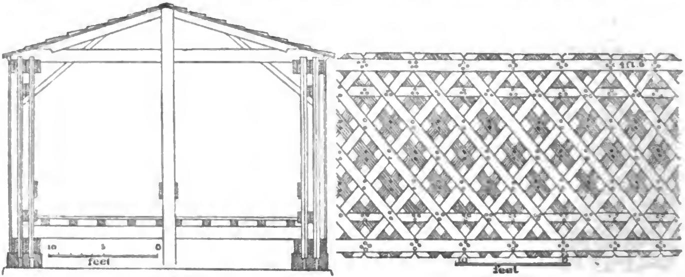
The spans of these bridges frequently exceeded 150 feet, in which case there were two upper and two lower chords, sometimes of timber 6 inches thick. For common road bridges of spans not exceeding 175 feet two trusses were sufficient if built of 3 × 12 white pine with open squares 2½ feet on a side in the clear; but many of them warped badly, and when applied to railroad purposes failed entirely. The great objection to this form of bridge is the unequal distribution of material with reference to the stresses. Its use in wooden structures is nearly obsolete in this country, but it is not uncommon in iron.

Several forms of improved lattice bridges have been suggested to overcome the objections to the Town truss. One of these is shown in fig. 14, in which the braces, instead of being single, are arranged in pairs, one on each side of the truss, and the tie, which is vertical, is made to pass between them; the end-braces also all rest on the bridge-seat, giving greater support to the structure, and the truss is effectively counterbraced by this arrangement of the members. To relieve the tension on the lower chord, double wedges are driven behind the ends of those members.

The modifications introduced by Bvt. Lt.-Col. S. H. Long, U. S. Engineers, March 6, 1830, consisted of (1st) Two modes of splicing the string-pieces—one by wooden, the other by iron splicing-pieces, of a different construction from any heretofore adopted. (2d) A system of bracing and framing such that the stresses or thrusts communicated by the braces to the trusses are resisted by shoulders or steps, as nearly as may be at right angles with the grain or fibres of the timber. (3d) A system of counterbracing by which the frames are rendered stiff and the bridge kept in uniform action. (4th) The introduction of metal bearing-plates, of copper, iron, or other suitable material, between the heel and toe of each main brace and the steps in the post against which they thrust. (5th) A mode of keying or wedging by which the centre of the bridge may be elevated and sustained in case of subsidence from shrinking or compression of the timber. The ratio of the panel height to its length is about 1½ to 1. (See fig. 15.) On Jan. 23, 1836, Col. Long patented an application of the lattice-work of Mr. Town to the horizontal lateral stiffening of the upper or lower string-pieces of his bridge as diagonal bracing.

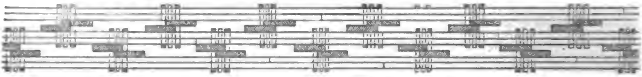
These patents were succeeded by others for various improvements in details, but it was found practically impossible to make these bridges, with wooden connections, sufficiently stiff for railway purposes.

The origin of the *bow-string girder*, a form deservedly popular and extensively used in both wood and iron, is clearly stated in the patent granted to George W. Long, U. S. A., Fort Jackson, La., March 10, 1830. The object of his invention was "to secure great strength in a bridge of framework of such shape as to support the greatest strength when in a horizontal position, assuming that form which will make it equally strong throughout. . The semi-ellipse possesses this property, as the framed beam of this shape will contain no superfluous weight of material; each timber will receive a portion of stress to support any weight placed on the bridge; and further, that this stress shall be in the longitudinal or strongest direction of them, either in thrust or tension. The form may be either an ellipse, a segment of a circle, or a triangle."



Cross-section.

Side-elevation.



Plan of Side-Trusses.

FIG. 13.—"Town" Covered Wooden Bridge for Railroads.

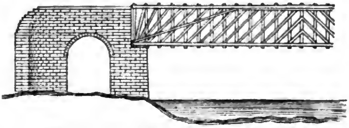
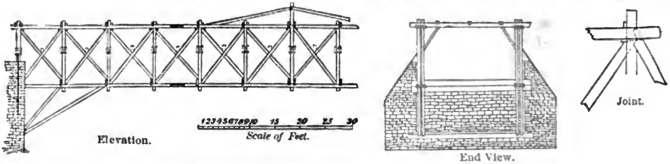


FIG. 14.—Haupt's Improved Lattice Truss.

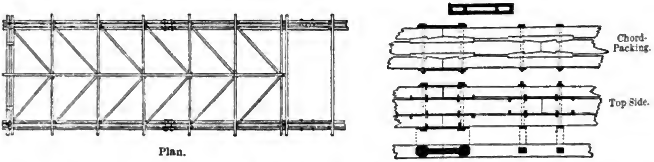
The bridge (fig. 16) consists—"(1st) of a string-piece made of one timber, or if more they are joined with straps of iron so well bolted through the timber as to make a joint as strong as the other parts of the string, which extends the whole length of the span. (2d) A set of posts are made to rest on the string, and made fast to it by straps of iron passing under it and well bolted to the bottom, etc. (3d A set of timbers joining the tops of the posts, or (4th The braces are a set of timbers placed diagonally between the posts, all inclining inward. . . . The material for construction may be wood, iron, or a combination of the two. The strings may be of iron, and also ties in opposite diagonals to the braces, of iron. If a chain is used for the strings, an inverted position of the bridge may be assumed



Elevation.

End View.

Joint.



Plan.

FIG. 15.—Long's "Jackson" Bridge.

(making it a suspension bridge). The saving in expense of piers and abutments not required to resist a thrust (as in Burr's and Long's bridges) must be counted a material ad-

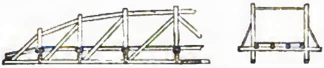


FIG. 16.—Long's Bow-string Girder.

vantage, especially on soft soil." Its application to roofs is also mentioned. The span is limited to 200 feet. A model 10 feet long and 1½ high, made of 1½-inch cypress timbers, supported 14 men whose united weight was 2140 pounds.

On July 10, 1840, William Howe of Warren, Mass., obtained a patent for a bridge in which all the members were of wood connected by keys and wedges and containing an arch. This was succeeded almost immediately by a patent by the same inventor, bearing date Aug. 3, 1840, in which iron rods are substituted for the wooden posts. The braces have a "run" of two panels. It was not until Aug. 28, 1846, that the cast-iron angle-blocks and sockets extending through the chord-pieces were patented.

The first bridge built by Howe was a highway span of 75 feet in 1840, and during the same year he erected the seven spans, of 180 feet each, crossing the Connecticut River at Springfield, Mass., at a cost of about $22 per lineal foot (see fig. 17). In this bridge the panels were only 7 feet long, the braces all of the same size, and the angle-blocks of wood. Though light and badly proportioned, it stood until 1853, when it was replaced by a "Howe" of more modern design, and this in turn was removed in 1874 to give place to a wrought-iron structure.

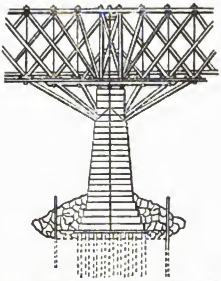


FIG. 17.—Howe Truss at Springfield, Mass.

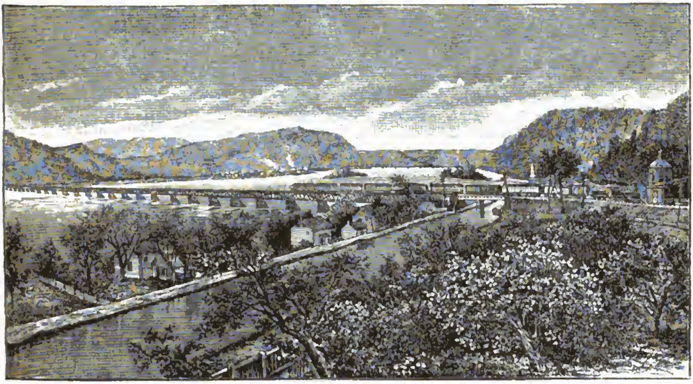


FIG. 18.—"Howe" Truss Bridge over the Susquehanna River, Pennsylvania R. R.

The later design in combination with an arch is clearly shown in the Rockville bridge on the Pennsylvania Railroad (figs. 18, 19).

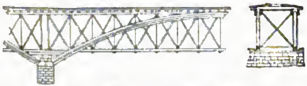


FIG. 19.—Howe Truss over the Susquehanna River on Pennsylvania R. R. (1848–49).

A form of truss almost identical with that of Howe was invented by Thomas W. and Caleb Pratt, and patented April 4, 1844.

They claimed "the combination of two diagonal tension-braces and straining-blocks in each panel of the truss frame of a bridge, by means of which the camber may be so regulated as to increase or diminish it either in whole or in sectional parts of the bridge."

The difference between the Howe and Pratt being in the substitution of wood for iron ties, and the reverse, the strains in the members were changed from tension to compression, and *vice versâ*, requiring slight modifications in the joints; but experience soon gave the preference to the Howe form, because of its requiring less iron, then the more expensive material, and the simplicity of details. It was found difficult to keep the two diagonal ties of the Pratt system in adjustment. This latter form, however, is well adapted to structures in iron, where it is frequently applied. For wooden bridges the Howe truss, although not the most economical, is unrivalled in simplicity of construction, rapidity of erection, and general utility, and it is still extensively used wherever timber can be obtained.

The Susquehanna River bridge at Rockville, on the Pennsylvania Railroad, which was built in 1848–49 by H. Haupt, C. E., is 3680 feet long, supported on twenty-two piers and two abutments, founded upon cribs. The piers are 6 feet wide on top and 10 feet at the springing of the arches. The spans are 160 feet from centre to centre of piers. The following are the principal dimensions of the superstructure, which is a Howe deck truss stiffened with a substantial wooden arch, as shown in figs. 18, 19:

Span in the clear	149 ft.	3 in.
Versed sine of lower arch	20 "	3 "
No. of panels	16	
Length of panel	9 "	9 "
Width in clear between arches	13 "	11 "
" " " chords	15 "	5 "
Angle of pier and chord	68¼°	

The arches are in three segments, the dimensions being at centre 11 inches + 7 inches + 21 inches deep, by 9 inches wide; at skew-back 11 inches each in depth, and same width. Height of truss from out to out of chords, 18 feet.

The cost of the masonry was $96,355.84, and of the superstructure $73,600, or $20 per lineal foot, making the entire cost about $170,000.

This bridge, which was single-track, carried the enormous business of the Pennsylvania Railroad until 1877, when it was replaced by one of iron (fig. 20).

On Feb. 20, 1849, J. Dutton Steele of Pottstown, Pa., took out a patent for a modification of the Howe truss, in which he merely substituted a wooden vertical tie in place of the iron rod, without in any way changing the action of the truss.

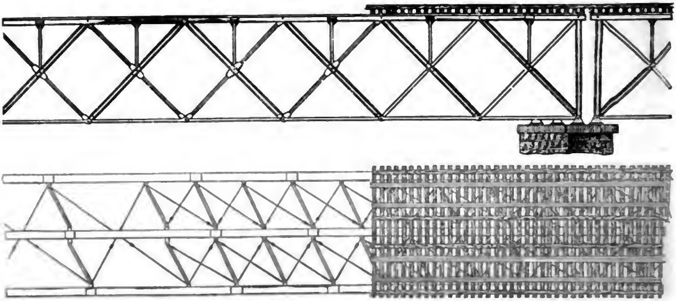


Fig. 20.—Stiffened Triangular Truss over the Susquehanna River at Rockville, Pennsylvania R. R.

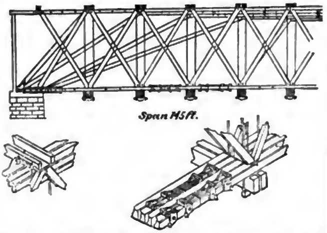


Fig. 21.—Wooden Railroad Bridges on Balt. and Ohio R. R.

The wooden truss most frequently used on the Philadelphia and Reading Railroad is that known by the name of its inventor, Foreman. It is similar to a Howe, but has additional arch-braces at the end-panels.

Mr. B. H. Latrobe, chief engineer of the Baltimore and Ohio Railroad, used for some time on that road a form of truss bearing some resemblance to the celebrated bridge at Schaffhausen, consisting of arch-braces and straining-beams, with vertical ties and diagonal braces and counterbraces, making a well-proportioned and scientifically arranged structure of great strength, as shown in fig. 21. The bridge is not so economical as some of those already cited.

Another form of wooden bridge possessing peculiar properties is that patented by Gen. D. C. McCallum (July 15, 1851), shown in fig. 22. It is a modification of the older form of Burr, in which the upper chord is made curved, so as to increase the depth of truss at the centre, and in which there are introduced arch-braces starting from the masonry, passing through the lower chord, and abutting against the heads of the posts of the end-panels. It was the boast of the inventor that these braces would sustain the bridge even if the lower chord were cut in two; and an instance actually occurred in which the lower chord fell under the weight of a train into the river, leaving the upper portion of the bridge standing. This bridge was exceedingly stiff, and for a time very popular, but it was so complicated that it was customary to make a full-sized drawing on a smooth floor from which to obtain patterns for framing. It is now obsolete.

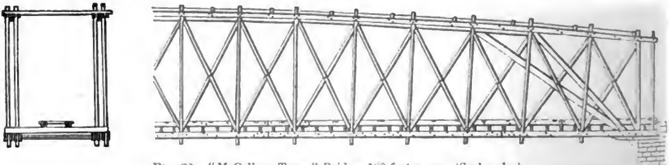


Fig. 22.—"McCallum Truss" Bridge, 180 feet span. (Scale, $\frac{1}{240}$.)

Iron Bridges.—Augustus Canfield of Plainfield, N. J., took out papers for a "tension iron bridge" on June 29, 1833, which is believed to be the first iron bridge patented in this country. It is represented as having a span of 80 feet, and two stringpieces—one above the other in a straight line, or rather *arching a little upward.* The upper and lower stringpieces, as shown in the drawing, are ten in number, and the limbs are 8 feet in length, of wrought iron. The distance between the upper and lower string-pieces is also represented as 8 feet. Vertical bars connect the strings at each joint, dividing the whole into 8-feet squares. Diagonal braces of cast iron, pointing downward from the centre toward the abutments, are placed in each of the squares. The inventor believed this to be the best arrangement of the materials that could be made, and remarked that "in this construction the stress upon each part by any given pressure is a matter of simple calculation;" also, that spiral springs formed in the chords, as seen in the drawing (fig. 23), may be used if desired, so as to leave every part free to expand or contract without any strain, the chords yielding about an inch to every two tons' tension.

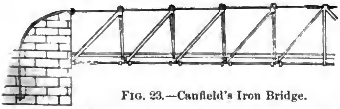


Fig. 23.—Canfield's Iron Bridge.

The earliest patent for trussed beams is that of Richard T. L. Witty of Lowell, Mass., dated Oct. 14, 1835, which is described as follows:

> "I combine the lateral thrust or pressure of a beam to the catenary curve, which said curve may be formed of rods of wrought iron or other metal, or of chain or rope, etc. But I prefer rods of wrought iron. The curve of iron must be stretched from end to end of a beam of wood, and firmly bolted thereto, and passing over stanchions or other supports of wood or iron fastened to the beam; which said supports may be placed at suitable distances under the beam to form the catenarian curve, and the more firmly to retain it in its place. By this arrangement a very considerable strength of beam may be obtained for the making of bridges over rivers, canals, etc., and for the formation of viaducts to carry over railways, in the construction of piers for docks or harbors, and for public buildings where considerable extent of beam may be required."

The invention is shown by the annexed diagram (fig. 24).

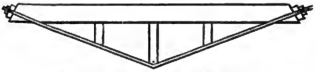


Fig. 24.—Witty's Trussed Beam.

Whipple Iron Bow-string.—On April 24, 1841, Squire Whipple of Utica, N. Y., patented a modification of an iron arch bridge as follows:

> "I claim the method of sustaining the flooring of bridges by iron trusses containing cast-iron arches, formed in sections or segments, in combination with diagonal ties or braces to sustain the form of the arch against the effect of unequal pressure (with or without vertical posts or rods), and wrought-iron arch-strings or thrust-ties to sustain the thrust and prevent the spreading of the arch in case the abutments and piers be not relied on for that purpose; also the divergence or horizontal expansion of the arch from the middle portion to the ends thereof in wooden trusses or arches, as well as in those composed of iron."

A large number of these bridges (shown in fig. 25) having a span of 100 feet, rise of 12½, were built by Mr. Whipple for common road-travel in the State of New York. The breadth was 19 feet from centre to centre, and there were two footwalks of 6 feet each outside the ribs. In cross-section the arches were of the form of an inverted channel-iron, having a net section at the crown of 18 square inches, and at the springing of 21 square inches. On top the arch was 11 inches wide at crown, but increased in width, by means of wide open-work, to 3 feet at springs. The strings or lower chord consist of four rods of 2 inches diameter to each arch.

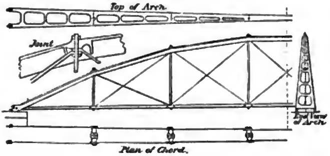


Fig. 25.—Whipple's Bow-string.

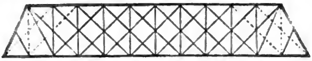


Fig. 26.—Whipple's Trapezoidal Truss.

The form generally known as the Whipple is a trapezoidal truss having parallel chords and inclined end-posts (fig. 26). It is adapted chiefly to iron bridges. Aside from its trapezoidal form, the Whipple bridge is distinguished by the introduction of trussed cast-iron posts or verticals, and long wrought-iron links, extending from panel to panel, forming the lower chords, and by several other minor peculiarities. (See figs. 27, 28.)

Lattice Iron Bridges. — About 1824, George Stuart patented a wrought-iron lattice truss in England, and in 1843, Sir John MacNeill erected an open-work girder of wrought iron of 84 feet span.

An iron lattice truss was invented by Nathan Rider of Massachusetts, Nov. 26, 1845. It is composed of an upper chord of cast T-iron, lower chord, upright posts, and diagonal ties. The upper chord is of cast iron of the form shown in fig. 29. The lower chord and ties of wrought iron are secured to each other and the upper chord by bolts. The posts are cast-iron I-beams, slotted at the ends to embrace the chords. A wedge is inserted on top of each post, under the top chord, to keep the diagonal ties in tension. These ties have a run of three panels, making three independent systems, which may be brought into greater or lesser action by the driving of the wedges, producing

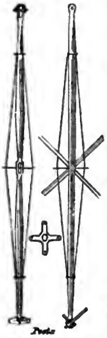


Fig. 27.—Posts.

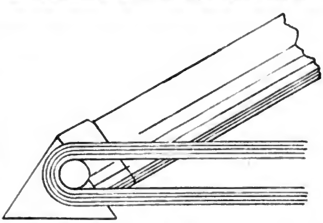


Fig. 28.—Early Form of Pin-Connection.

ambiguity on the strains. This bridge was erected at One-hundred-and-ninth Street in New York.

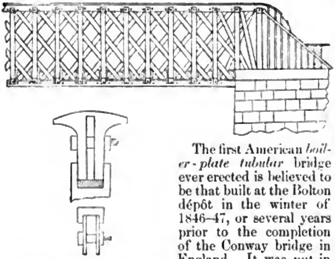


FIG. 29.—Rider's Iron Lattice Bridge.

The first American *boiler-plate tubular* bridge ever erected is believed to be that built at the Bolton dépôt in the winter of 1846–47, or several years prior to the completion of the Conway bridge in England. It was put in place in April, 1847, on the Baltimore and Susquehanna Railroad, by its inventor, James Millholland, who thus describes it:

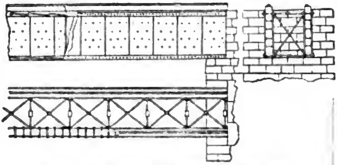


FIG. 30.—Millholland's Tubular Girder (1847).

"The bridge (fig. 30) is made of puddled boiler iron $\frac{1}{4}$ inch in thickness. The sheets standing vertical are 38 inches wide and 6 feet high, riveted together with $\frac{3}{4}$ rivets $2\frac{1}{2}$ inches from centre to centre. Each truss frame is composed of two thicknesses of iron 12 inches apart, and connected by $\frac{5}{16}$ iron bolts passing through round cast-iron sockets at intervals of 12 inches; the two trusses are connected by lateral bracing, which is composed of $\frac{3}{4}$-inch round iron, set diagonally and bound together at the crossing by two cast-iron plates about 4 inches in diameter, the sides next to the bracing being cut in such a manner that when the two $\frac{5}{8}$-inch bolts passing through them were screwed up, it holds them firmly together. There is also a bolt passing through both truss-frames and through the heels of the lateral bracing, at right angles to the bridge, which secures the heels of the lateral braces and by means of a socket in the centre make a lateral tie to the bridge, giving it stability. The lower chords are of hammered iron, there being some difficulty at that time to get rolled iron of proper size, and are in one entire piece, being welded from bars 12 feet long. There are eight of them, 5 × $\frac{3}{4}$ inches, one on either side of each piece of boiler iron, and fastened to it with $\frac{3}{4}$-inch iron rivets 6 inches distant from each other. There are but four top chords, and of the same size as the bottom, two on each truss near the top, the timber for the rail making up the deficiency for compression. The entire weight of the bridge is 14 gross tons, and cost $2200." The span is 55 feet, or $40 per linear foot, which the inventor thinks can be reduced to $30. The centre of each girder was placed exactly under the rails, which were spiked to the timber forming the top chord. The breaking strain of each girder was 125 tons of distributed load.

The tubular bridge does not seem to have met with favor in the United States, but in England and Canada several very expensive structures of this class have been erected—notably, the Britannia and Victoria bridges, which are remarkable for the boldness of their designs and for the energy and ability displayed by their projectors, Messrs. Fairbairn & Stephenson, in conducting the work.

Such were the principal bridges in common use in America, both for highways and railroads, until the middle of the nineteenth century, when the researches into the strength of materials by numerous experimenters, and the investigations into the theory of strains in bridge and roof members by competent writers, gave a fresh impetus to the subject of framed structures and transformed an art into a science.

This transformation, and the substitution of iron for wood, were, however, very gradual. The resulting structures of wood and iron were known as "*combination*" bridges.

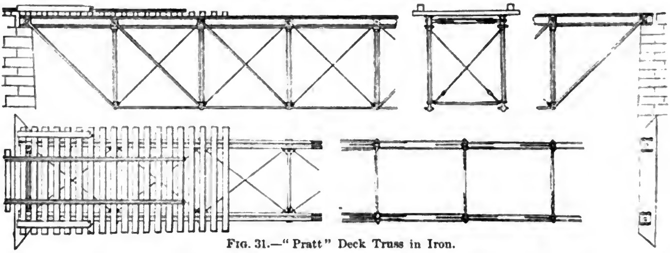


FIG. 31.—"Pratt" Deck Truss in Iron.

The application of iron to the Pratt truss when used as a deck bridge—for spans of 70 feet and depth of 10 feet—is shown in fig. 31.

The Bollman Truss.—Wendel Bollman obtained a patent Jan. 6, 1852, for an iron truss bridge, which was adopted by the Baltimore and Ohio Railroad Co., and erected at numerous points on its line.

The peculiar features of this form of bridge (fig. 32) consist in the suspension of the load at the foot of each post by the tie-rods running directly to the ends of the top chord, and in the details of the connections to admit of an automatic adjustment for the great differences of length in the ties near the ends of the bridge. It is, in fact, a suspension bridge in which the horizontal pull is resisted by a cast-iron top chord. One of the latest structures of this form is the large bridge at Quincy, over the Mississippi River.

The bridge at Harper's Ferry, across the Potomac, 124 feet span and 17 feet 6 inches deep, was tested June 1, 1852, by running over it three first-class engines weighing in the aggregate 136·7 tons, being over a ton for each foot in length of the bridge, at a speed of about eight miles per hour, giving deflections at the first panel post of $\frac{5}{16}$ of an inch, and at the centre of $1\frac{5}{16}$.

The lenticular girder, as constructed at Saltash by Brunel in 1859, of 455 feet span, was doubtless anticipated by the patents of Messrs. H. L. Hervey of Illinois and R. E. Osborn of Ohio, issued Aug. 21, 1855.

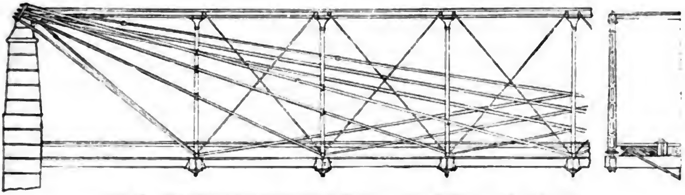


FIG. 32.—Half Elevation and Section of Bollman Truss, Baltimore and Ohio R. R.

In their prospectus they show a structure (fig. 33) the action of which is thus described:

"This structure of suspension cables, *R R*, passing around and fastened to the blocks *A A*. These blocks slide on rollers or balls and rest upon plates *B*, which plates rest upon the towers *C*. The arch-stringers rest against the sliding blocks *A A*, and said blocks are prevented from sliding too far back by the cables, *R R*, and are prevented from sliding too far forward by the arch-stringers; therefore, when a weight is applied to any point upon the bridge it causes the arch to rise and lift a portion of the weight in such a manner that one-half will rest upon the cables and the other half rest upon the arch. There is also a truss formed of the arch and lower string-pieces, connected together by tension-braces *P P* and posts *J*. There is a lower truss, which is adjustable by the sliding blocks *M*, over which the tension-braces *Q Q* pass, thus making the structure adjustable in every part; the weight likewise bears equally on every part, let it be placed at what point it may. It can be made of a long span, or by not using t e towers *C*, or the lower truss, and by placing the plates ar rollers *B* and sliding blocks *A A* upon the main abutments, it is well adapted for short spans."

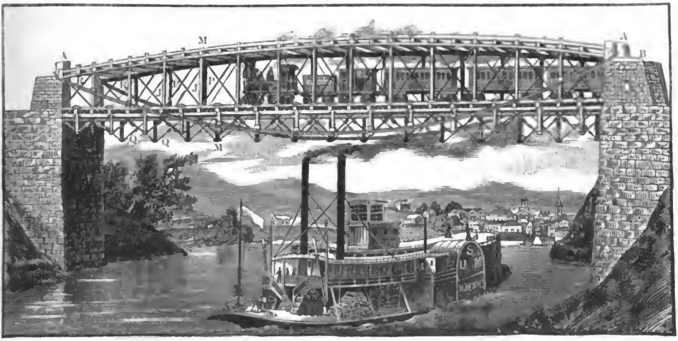


FIG. 33.—Lenticular Bridge, designed by Hervey & Osborn.

The similarity of form between this and the well-known lenticular truss, as at present manufactured under the Douglas patents, is clearly illustrated in fig. 34.

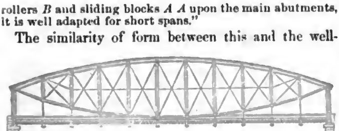


FIG. 34.—Elevation of Lenticular Bridge.

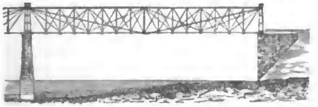


FIG. 35.—"Fink" Truss Bridge over Monongahela River, on Baltimore and Ohio R. R.

The patent of Albert Fink dates from May 9, 1854, although his bridges were in use some years before. One of the first of them, built over the Monongahela River on the Baltimore and Ohio Railroad in 1851 and 1852, is still extant (fig. 35). The chords and posts are of cast iron, and the ties of wrought. This was then the longest iron bridge in America. It consists of three spans of 205 feet each. The special features are clearly illustrated in the accompanying diagrams (figs. 35, 36, 37, 38). Numerous modifications of this quadrangular truss were generally introduced in the railroad system of the United States, and are still in use, both in wood and iron or in combination. The total weight of a 200-foot span, exclusive of timber, is estimated to be 208,392 pounds.

An instance of a successful attempt to construct a long-span bridge prior to the introduction of the modern machinery for rolling bridge-members for compression may be seen in the Steubenville bridge, spanning the Ohio River. This structure (fig. 39) was partially completed in 1856, when work was suspended until 1862. At this date the law required a clear channel of 300 feet between piers and a clear height of 90 feet above low water, which rendered it impossible to apply any existing systems of wrought iron. The contractors adopted a modification of the Linville-Piper patent truss, dividing the full length of span from centre to centre of bearings, 319 feet 0¾ inches, into twenty-four equal subdivisions of 12 feet 3 inches each, and two end panels of 12 feet 6⅜ inches. The height from centre of lower chord to top of upper at ends is 28 feet. Camber of upper chord, 9 inches. The lower chords consist of eight lines of patent upset eye-bars, to resist a unit strain not exceeding 10,000 pounds. The lower chords, posts, and ties are pin-connected, the diameter of pins being 4½ inches. The upper chords each contain two similar tubes of cast iron, having an external diameter of 15 inches at centre and sloping slightly to ends of panel. The posts are also twin tubes of cast iron 8 inches in diameter, combined by intermediate webs and rails, and made in two sections with flanged ends, which are bolted together. The parting-plate at the middle of each post has four projecting pieces, with concave bearings to receive the truss-rods, which are secured near the tops and bases of the posts. These rods deflect 18 inches, and are adjustable by sleeve-nuts, the arrangement being precisely that known as "Whipple's post." The diagonal ties are square bars, having an eye at lower end, and are swaged round at top to admit a screw-thread and nut, by which they bear against angle-bosses cast on the chords. There is the usual lateral bracing and rolled-plate bearings at end for changes of temperature. This channel-span was erected in 1865 on an auxiliary Howe truss supported by a wooden pier and two timber abutments, and was completed in three weeks. The weight of cast iron in this span was 2136 pounds per linear foot, and of wrought iron 1423 pounds. The line was opened in Sept., 1865. Contractors, Keystone Bridge Co.; engineer, J. H. Linville.

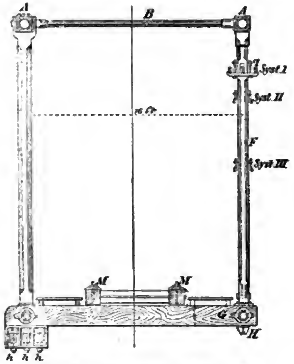


FIG. 36.—Cross-Section of Fink Truss.

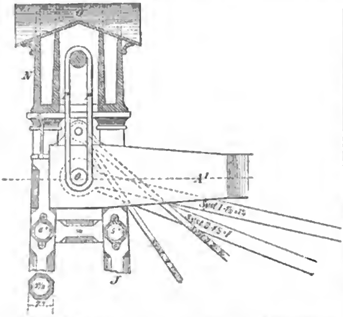


FIG. 37.—Suspension Link at end of Top Chord, Fink Truss.

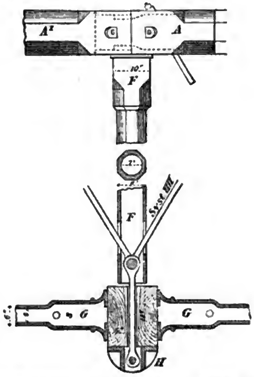


FIG. 38.—Post-and-Chord Connections, Fink Truss.

This pioneer type of long-span bridges was soon followed by similar trusses over the Monongahela at Pittsburg, span of 260 feet; over the Ohio for the Baltimore and Ohio Railroad at Bellaire and Parkersburg, with spans of 350 feet; and the great span of 420 feet on the Newport and Cincinnati Railroad at Cincinnati. (See fig. 40.) The Parkersburg bridge has two spans of 348 feet each, four of 200 feet, with numerous shorter spans; that at Bellaire has one span of 348 feet, one of 250, four of 200, and a number of 107 feet. The approaches consist of forty-three stone arches of 28 feet 4 inches span on a five-degree curve. The cost was about $1,000,000.

This same general design has been adopted for the great bridge over the Hudson at Poughkeepsie (see fig. 41), having five spans of 525 feet each and a clear height of 130 feet above high water. The grade will be 190 feet above the same level. The depth of water, varying from 50 to 60 feet, will make the piers of unusual height. The river at this point is 2430 feet wide, requiring four piers to be placed in the bed of the stream. These are founded on caissons—one at a depth of 122 feet, in which case the dredging was carried to the extreme depth of 130 feet and a concrete foundation put in place. The caisson of No. 4 is filled with concrete to a height of 77 feet, at which level, 20 feet below low tide, the granite masonry begins. The superstructure of this bridge is not yet (Nov., 1882) erected, in consequence of the delays occasioned by the great depth and volume of water, extreme height of piers, and length of spans, all of which combine to make it one of the grandest and most difficult pieces of bridge-construction yet undertaken.

The *stiffened triangular girder* which replaced the wooden Howe truss spanning the Susquehanna River at Rockville was erected in 1877, under the supervision of the Messrs. Wilson Bros., without interruption to travel, at a cost of $326,614.10. The contractors were the Delaware Bridge Co., who completed the work between July 1 and December 1. The iron-work was constructed and assembled at the Edgmoor Iron Works

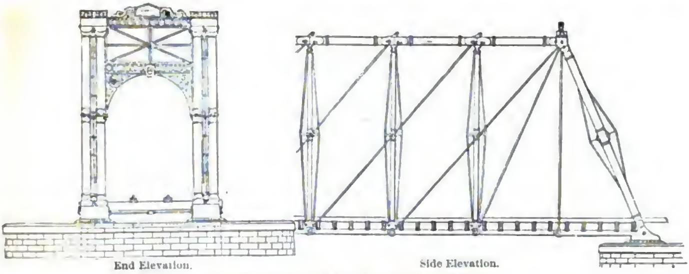


Fig. 39.—Ohio River Bridge, near Steubenville.

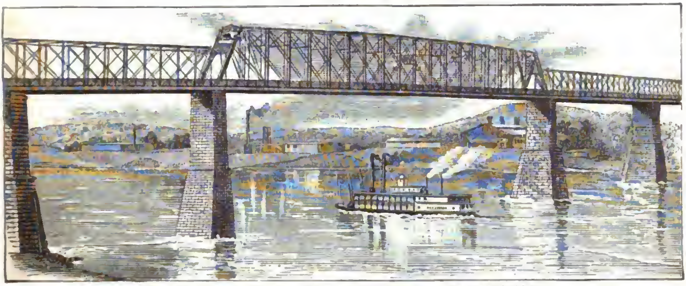


Fig. 40.—Channel Span of Newport and Cincinnati Railroad Bridge.

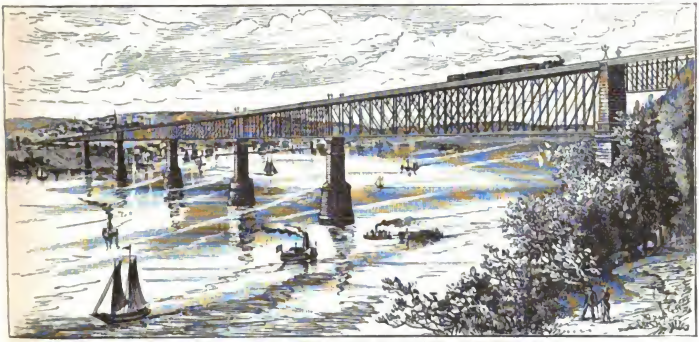


Fig. 41.—Hudson River Bridge at Poughkeepsie, N. Y.

of W. Sellers & Co., Philadelphia. This is perhaps the most rapid iron-bridge construction under difficult conditions on record (fig. 20).

The general dimensions of the present structure are as follows:

21 spans of 156 ft. 6½ in. 2 " " 151 ft. 0½ in.	Total length	3675 ft.
Height of truss from centre to centre of chord		19 ft. 7 in.
Number of trusses per span		3
Width of bridge from centre to centre of outer trusses		22 feet.
Height of rail above water		45 "
Angle of askew		68°

Weights adopted for calculation:

Dead load per lineal foot	2,750 pounds.
Rolling load per lineal foot	6,000 "
Total weight of iron in one span	289,500 "
Total weight of iron in bridge	3,335 tons.

The top chords are 12-inch "channels," with thickening plate-covers on the top, the bottom being latticed. The web consists of a double system of main struts and tension-bars inclined at 45°, and connected at their intersection midway between the chords by pins. From this point a vertical sub-post extends upward to support the middle of the panel of the upper chord. The splices are simple butt joints strengthened by cover-plates. The braces are "channels" latticed on two sides; the ends are reinforced, and they are bored for upper, middle, and lower pin-connections.

Members subjected only to tension are made of eye-bars, as in bottom chords (figs. 20, 42). The lateral struts and rods are attached directly to the pins by U-shaped nuts, and a vertical bolt dispensing with the use of cast iron.

The cross-ties of oak, 7 × 14, were laid directly upon the upper chords, which were proportioned to resist this extra bending strain. The ties were spaced 21 inches apart. During the progress of the work the average number of daily trains was sixty-four, yet no interruption to traffic occurred.

This form of truss has been extensively introduced by its engineers. It is light, strong, and economical. (See fig. 42.)

The longest single-span trussed girder in existence is believed to be that crossing the Ohio River at Cincinnati on the Cincinnati Southern Railroad; whilst one of the boldest and most economically constructed trusses in American experience is the continuous girder of three spans crossing the Kentucky River on the same railroad. These bridges are described by Mr. T. C. Clarke, C. E.:

"The bridges of the Ohio have to be constructed in accordance with acts of Congress of the United States, fixing their minimum spans and heights, and all the plans have to be approved by the U. S. engineers. The requisitions laid down by Congress demand a channel-span of 500 feet in the clear between the bases of the piers, or 515 feet between the points of support, placed at a height of 105 feet above low water in the river, which is 10 feet deep, while the river rises 62 feet in times of floods.

"The lower line of staging of the bridges at Cincinnati was erected in December, 1876. The surface of the river was covered with ice. A sudden thaw and rise of water of 15 feet washed away the lower staging. Operations were suspended until June, 1877, when the staging was rebuilt. The bottom of the timber trestles stood on the rocky bed of the river. About 500 feet above the line of the bridge a timber crib was sunk and filled with stone. From this a fender of coal-barges chained together was let down to each pier, protecting the trestle from being struck by boats or drift-wood.

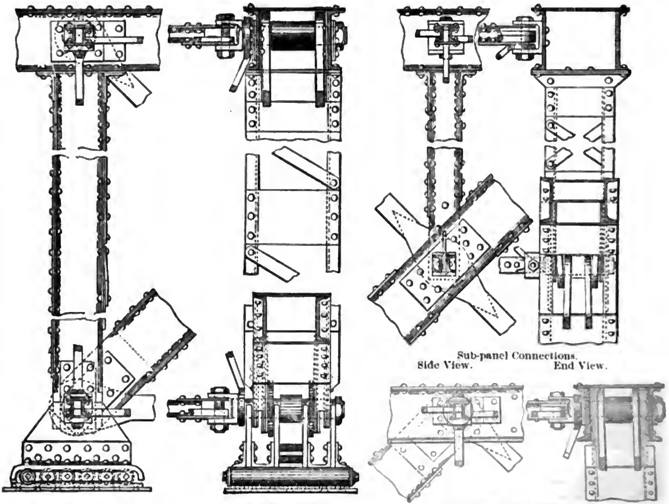
"The iron-work of this channel-span of 515 feet had been submerged by a freshet and required washing. The iron was cleaned, elevated 100 feet by steam-power, run forward over two spans of 300 feet each, and then hoisted into position by two travellers on the top staging worked by hand. This was all done in 24½ working days by an average force of 60 men. The span was swung clear of its staging by knocking out folding wedges, and then required 30 men for six days more to adjust it, put on cross-girders and track-stringers, and lay the ties and guard-timbers.

"The span was tested by running over it seven locomotives and four loaded platform cars, their combined weight amounting to 431 tons. The centre deflection of the east truss was $2\frac{1}{12}$ inches; the permanent set was $\frac{1}{16}$ inch. The centre deflection of the west truss was 2 inches; the permanent set was none.

"The cost of this span was $209,500. This bridge was designed and executed by Mr. J. H. Linville, C. E.

"The *Kentucky River bridge* consists of three spans of 375 feet each, carrying the Cincinnati Southern Railway across a limestone cañon at a height of 280 feet above the bed of the stream. The piers are of stone to a height of 60 feet, which carries them a little above the highest recorded floods, and of iron for the rest of their height. As the floods are very sudden, it was decided to adopt a plan of construction obviating 'false works' or stagings of timber, which might be swept away by freshets or knocked down by rafts, which pass by during floods at a speed of 7 or 8 miles per hour.

"In 1854, Mr. J. A. Roebling had begun to build a suspension bridge of 1236 feet span across this chasm, but the work was abandoned for want of funds after two towers and two



Sub-panel Connections.
Side View. End View.

Side Elevation. End Elevation. Full Panel, upper chord.

FIG. 42.

sets of anchorage had been constructed. Mr. C. Shaler Smith, the engineer whose design was adopted, took advantage of these towers by bolting the first panel of his bridge on each side to them, and then corbelling out panel by panel. The towers were calculated to be strong enough to carry 196 feet of projecting spans. At this point temporary towers of wood were built, which gave an intermediate support. The corbelling-out process was continued until the shore spans each reached the main iron piers, which were built up simultaneously, so that the two met in mid-air. These piers had been on rollers, as it was impossible to foresee the temperature at which the junction would take place. Each pier, weighing 200 tons, was moved horizontally until a junction was made. Each half of the centre span was then corbelled out as before until they met in the centre. At this stage of the work, the upper chords being in tension and the lower in compression, the former were nearer to each other than the latter, the gaps being—upper chord, east gap, 3 inches; west gap, 2 inches; lower chord, east gap, 4 inches; west gap, 5 inches. The gap of 2 inches in the west upper chord was first closed by screw-jacks, which had been placed between the ends of the lower chords and the abutments on the shore spans, and by moving the piers together. This left a gap of 1½ inches between the ends of the east top chord. At mid-day, the temperature of the air being 70° Fahr., all the horizontal lateral rods tending to draw these ends together were screwed up and the counter slackened. The contraction of the lateral rods drew the gap together. On the following morning, at a temperature of 40° Fahr., the gap had closed and the top chord connections were riveted up. The contraction due to temperature had by that time withdrawn the shore ends of the lower chords from the screw-jacks ¾ inch. These were then screwed home so as to take up this space, and by midday the lower chords had expanded until the gap in the east chord was closed, which was then riveted up, and by a similar process the gap in the west chord was closed.

"Up to this time this bridge was a girder of 1125 feet long, continuous over three spans; but it had been foreseen that a continuous girder would not answer for this situation, because, while the abutments on the cliffs were stationary, the iron piers would constantly rise and fall with changes of temperature, and so vary the strains on the web system. It was therefore determined to hinge the shore spans at points 75 feet from the piers, leaving a centre girder 525 feet long supported by piers 375 feet apart. By this means the shore spans were practically reduced to 300 feet each, one end resting on the abutment, and the other on the overhanging end or cantilever of the centre span. The final operation, therefore, was to cut the lower chords of the shore spans at points previously determined by calculation, at which points tenon-joints had been made and temporary rivets inserted. These rivets were cut out, and the mean motion of the several joints was only $\frac{5}{16}$ inch, and the change in the levels barely perceptible. This proves the accuracy of the method used to determine the point of contrary flexure, which was to work out the strains panel by panel as in calculating discontinuous spans. To avoid ambiguity in the web strains at the hinging points, both of the web systems of diagonal rods were consolidated into one member at the point of contrary flexure, and separated again after the hinge was passed. When the bridge came to be tested, it was found that the movement of the lower chord tenons under the passing load was 1½ inches. This shows how great may be the strains concealed in the web system of a continuous girder of large span at the point of contrary flexure.

Chronological Table of Tubular and Girder Bridges for Single-track Railway, constructed of Iron Spans exceeding 200 feet.

COMPILED BY T. C. CLARKE, C. E.

Date of erection.	Place.	Name of engineer.	Clear span between points of bearing.	Tons of iron (2240 lbs.).	Dimensions in feet. Width between centres of girders.	Dimensions in feet. Panels. Number.	Dimensions in feet. Panels. Length.	Dimensions in feet. Height.	Loads in lbs. per lineal foot. Dead load (iron and timber in track).	Loads in lbs. per lineal foot. Live load (engines and cars).	Strains, in lbs. per square inch in area. Tensile. From constant load only.	Strains. Tensile. From total constant and moving loads.	Strains. Compressive. From constant load only.	Strains. Compressive. From total constant and moving loads.	Test load.	Centre deflection.	Dead load of iron, timber, etc.	Deflection of span on removal of scaffolding.	Remarks.
					Ft. In.		Ft. In.	Ft. In.							Tons.	In.	Tns	In.	
1848	Conway	Robert Stephenson	400	1112	15 0		Tube	25 6	6, 50	2240	9,200	12,400	......	......	300½	2·13	1112	8·06	Tubular girder.
1850	Menai Straits, Britannia, Wales	Robert Stephenson	460	1553	15 0		Tube	30 0	7,190	2240	10,373	13,396	......	......	348	0·68	1553	11·73	Tubular girder.
1856	Vistula River, Dirschau	Lentze	397	838	21 5		Close lattice	28 6	6,160	3128	7,200	9,720	7200	9,720	......	....	....	......	All rolled iron, one line of rails only taken. Close lattice with posts, two spans continuous.
1859	St. Lawrence River, Montreal, Can.	Robert Stephenson	330	656	16 0		Ends centre	22 0 30 0	4,900	2240	7,690	11,290	6060	8,800	285	1⅜	743	7⅜	Tubular girder.
1859	Saltash	I. K. Brunel	455	945	17 0	12	38 0	30 0 60 0	6,500	2240	6,650	8,960	......	......	354	1·2	1100	2¼	Lenticular girder.
1861	Inn River, Passau	....	320	327	15 0	23	14 0	30 0	3,450	2660	6,700	13,700	5800	12,000	165	0·13	390	0·9	Riveted lattice. All rolled iron.
1862	Rhine River, Mayence	Gerber	345	359	15 1	13	25 4	24 6 49 2	4,500	2520	7,130	11,600	......	......	450	0·27	719	2⅜	Pauli system; all riveted work, lenticular girder.
1864	Ohio River, Steubenville, U.S.	J. H. Linville	319	494	16 6	25	12 3	28 0	4,000	3000	3,700	10,000	3100	6,000	......	....	....	......	Top chords and posts of cast iron, rest of rolled iron; quadrangular girder.
1868	Lek River, Kuilenburg, Holland	G. Van Diesen	492	2234	30 4	38	13 1	26 3 65 7	18,200	3000	11,800	14,500	8200	10,000	595	1·32	1880	3·05	All rolled iron, riveted. Lattice arched top.
1870	Ohio River, Parkersburg and Bellaire, U. S.	J. H. Linville	348	338	18 0	22	15 6	33 0	2,500	3000	4,545	10,000	3636	8,000	......	....	....	......	All rolled iron. Pin connections; quadrangular girder.
1870	Ohio River, Louisville, U.S.	Albert Fink	366	497	30 0	24	15 4	46 0	3,665	2600	7,000	Chords 12,000 Diag 10,000	3500	6,000	200	1	....	......	Top chords cast, rest rolled iron. Pin connections; quadrangular girder.
1870	Ohio River, Louisville, U.S.	Albert Fink	396	623	30 0	28	14 2	48 0	4,166	2600	7,400	Chords 12,000 Diag. 10,000	3700	6,000	200	1⅛	....	......	Top chords cast, rest rolled iron. Pin connections; quadrangular girder.
1871	Ohio River, Cincinnati, U. S.	J. H. Linville	415	390	19 0	20	20 9	41 6	5,500	4500	5,500	10,000	4950	9,000	......	....	....	......	Carriage-way on each side of railway. Pin connections; quadrangular girder.
1877	Susquehanna River, Havre de Grace, U. S.	Phœnix Bridge Company	307	215	16 0	17	18 2	35 0	2,150	2240	4,900	10,000	4400	9,000	......	....	....	......	All rolled iron except joint blocks. Pin connections; quadrangular girder.
1877	Kentucky River, Dixville, U. S.	C. Shaler Smith	375	425	18 0	20	18 9	37 6	2,700	2087	5,080	10,000	4570	9,000	331	1·62	....	......	All rolled iron. Pin connections; quadrangular girder.
1877	Ohio River, Cincinnati, U. S.	J. H. Linville	515	1116	20 0	20	25 9	51 5	5,400	1818	7,470	10,000	6600	9,000	431	2	1286	See remarks.	All rolled iron. Pin connections; quadrangular girder. Estimated camber, 4½ inches; actual, 3¾ inches.

"The bridge expands from the centre each way, bending the tops of the piers toward the shores; the greatest observed movement has been half an inch each way. There are rollers on the abutments, and the greatest observed motion has been 3 inches.

"The erection began Oct. 16, 1876, and ended Feb. 20, 1877, thus occupying four months and four days. At no time did the staff exceed 60 men, and the average number was about 53. The cost of the erection of this bridge was very small, considering the difficulties of handling and distributing the iron. The total cost of erection, including plant, was $404,230.

"The dimensions are as follows:

Total length of iron-work	1138	feet.
" " of iron between pier-centres	1125	"
Depth of truss	37½	"
Width "	18	"
Iron pier at base	28 feet by 71½	"
" " top	1 foot " 18	"
Height of pier	177¼	"
Masonry pier	42 feet by 120 feet by 71	" high.
Height of rails above low water	275½	"
" " " river-bed	279½	"
Flood rise	57	"

"Seven floods took place during the construction of the bridge, their rise varying from 56 to 47 feet.

"This is not only one of the boldest and most original pieces of bridge-engineering in America, but, when judged by the crucial test of accomplishing a great deal at the least possible cost, it stands very high among engineering structures all over the world, and its design and execution reflect the highest credit upon its engineer, Mr. C. Shaler Smith, C. E."

The highest truss bridge in the world is probably that on the Mont Cenis Railway, which spans a ravine in the Piedmontese Alps. It is known as the Comba Scura bridge, and has a height of 395 feet and a span of 185 feet 2 inches between the abutments. The bridge at El Kantara in Algeria has almost the same dimensions—viz., 393·6 feet high and 188·27 feet span.

COMBINATION BRIDGES.—This class represents an intermediate or transformation stage between wood and iron, and still maintains its place from the facility with which the materials may be procured and erected, and also because of its cheapness in first cost. The practice is to make all members subjected to tension only, of wrought iron, and all others of wood, with cast- or wrought-iron connections. In a valuable paper on this subject, Mr. C. L. Strobel, C. E., of Pittsburg, recommends the use of wrought iron for the struts near the centre of the bridge, as well as for the floor-beams, thus enabling the structure to be converted into one solely of iron when the wood shall have decayed. The design shown in fig. 43 is of the *Warren* type, and is adapted for spans of from 168 to 190 feet. It is said to be much more economical than any of the combination bridges in use at present, as those of Howe, Pratt, Post, and others. The floor-beams, of wood, are suspended from the pin at the panel and sub-panel points. A cast-iron shoe connects the wooden post and strut with the eye-bars by means of a pin.

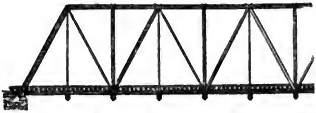


FIG. 43.—Combination Bridge, with Wooden Floor-beams.

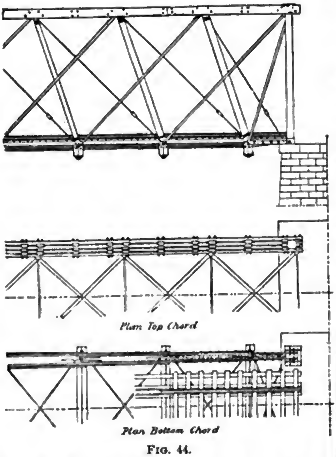


FIG. 44.

A similar form of connection is used in the wrought-iron "combination."

The Post Bridge (fig. 44) is a combination of wood and iron, the former being used for the compression, the latter for the tension, members. The road-bearers, of wood, are supported upon plates suspended from pins at the panel-points of the lower chord. The posts are inclined at an angle of 39° to the vertical, and the ties have therefore a "run" of a panel and a half. The connections of posts and chords are made by means of cast-iron shoes placed upon the ends of the posts. These bridges are adapted to spans of 200 feet or less, and are still extensively used on railroads in the United States.

STEEL BRIDGES.—But few steel bridges have been erected, owing to the limited knowledge of the best physical conditions of the material. Those in existence are of too recent date to furnish reliable data as to the ability of steel to fulfil all the requirements of strength, lightness, economy, durability, uniformity of texture, etc.

The first and longest steel tubular arch in existence is the 522·39 feet span of the St. Louis bridge, erected between 1868 and 1874, and described under the section on *Erection*. This was soon succeeded by a steel quadrangular girder at Glasgow, Mo., and this in turn by a bridge opened Oct. 21, 1882, between Bismarck and Mandan, Dak. The bridge carries the Northern Pacific Railroad across the Missouri at an elevation of 100 feet above low water. It consists of three spans of 400 feet each, with a shore-span at either end of 125 feet (fig. 45).

The western approach consists of a trestle 1600 feet long and about 65 feet high, built of wood and protected from ice and drift by dykes on both sides. The tests were successfully made on the date above mentioned, and their result reflected great credit on the engineer, Mr. George S. Morison. Cost, about $1,000,000.

Among the latest British projects of engineering science may be noted the *steel* bridge over the Firth of Forth at Queensferry (fig. 46), having a total length of 5050 feet, and thus described in *The American* of May 10, 1882:

"The bridge over the Firth of Forth will be one of the greatest marvels of engineering the world can show, as its two principal spans will be each 1700 feet, its two side-spans 675 feet, and the height above high water of the central 500 feet of the two main spans 200 feet. Any girder may conveniently be considered as a combination of two cantilevers with a central girder, and in this case the main spans will actually be built of two huge lattice cantilevers, each 675 feet long, and a central girder 350 feet long. The lower member of the cantilever, where it springs from the piers at 20 feet above high water, is a steel tube 12 feet in diameter and 2 inches thick, diminishing in the centre girder to a trough 3 feet deep. The upper chord of the cantilever slopes downward, while its lower chord is arched upward to permit of free navigation, so that the bridge has a varying height. The width will also vary at different points, diminishing from 120 feet over the piers (which are 150 feet long in the direction of the length of the bridge) to 27 feet in the centre girder.

"That British railway engineers have largely ignored the force of the wind in their calculations was shown but too plainly by the fall of the Tay bridge during a fearful storm; but there appears to be no chance for such an accident in the Forth bridge, since the combined pressure of the rolling load and of a wind pressure of 56 pounds per square foot (the limit recently adopted by the British Board of Trade) will equal only one-fourth of the strength of the steel employed in the structure. The depth of the water, 200 feet, compels 'erection by overhang;' that is to say, each bay of ties, struts, braces, etc., will be added to the last, finished and braced against storms before the next is commenced, till the immense cantilevers, like huge wings projecting from the piers, stand ready to receive their connecting girders."

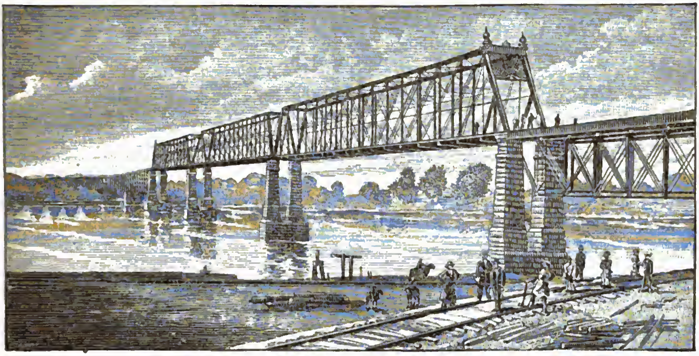


Fig. 45.—Steel Bridge at Mandan, over the Missouri River, Northern Pacific R. R.

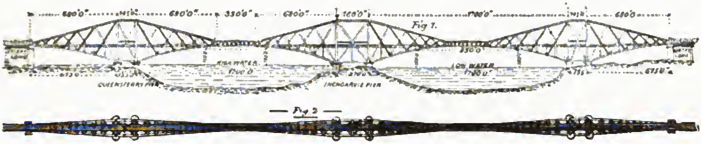


Fig. 46.—Proposed Bridge over the Firth of Forth, Scotland.

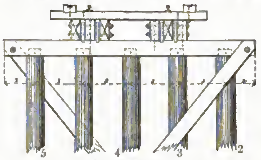
Trestle and Pile Bridges.—This form of bridge dates from the earliest period of which we have any authentic record, but modern appliances have rendered it so available in passing obstacles otherwise insurmountable that a brief review of the progress in this department cannot be omitted.

Of wooden pile bridges the present (1883) practice is well exemplified by the annexed drawing (fig. 47) of the standard used on the Northern Pacific Railroad for structures over 14 feet in height.

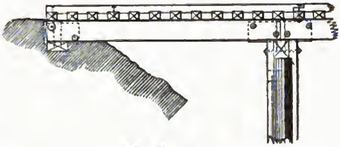
The first examples of *cast-iron trestles* of any magnitude were erected in 1853 by Mr. Fink on the Baltimore and Ohio Railroad. Two of these viaducts cross the Cheat River at an elevation of 250 feet on a grade of 2 per cent., and one of them on a curve of 800 feet radius. The trestle is 60 feet high, composed of posts in two sections, the diameters being 7 and 6½ inches, with ½-inch thickness of metal. These viaducts are 500 feet long, built in lengths of 125 feet. They have been in use thirty years, and are still doing good service.

About 1864, Mr. C. Shaler Smith substituted *wrought iron* for other materials in the construction of viaducts, using the Phœnix columns for posts. Each "bent" consisted of two posts, with cross struts at intervals of 30 feet, united by diagonal tie-rods. The bents were spaced 30 feet apart and supported trussed girders carrying the roadway. This general system has now become very common, and is well adapted to suit the peculiar requirements of each case.

It is well exemplified in the Lyman Viaduct, built by the Phœnix Bridge Co. on the Connecticut Air-Line Railroad at East Hampton, Conn. This structure is 1100 feet long and 135 feet high.



End Elevation.



Side Elevation.

Fig. 47.—Pile Bridges, Northern Pacific R. R.

One of the most remarkable wooden trestles ever constructed, both on account of its height and the rapidity with which it was assembled, was that erected over Potomac Creek, Va., on the railroad from Acquia Creek to Fredericksburg during the late Civil War (fig. 48). Of this structure Major-Gen. McDowell, commanding Army of Potomac, testified as follows before a court of inquiry: "The Potomac Run Bridge, 400 feet long by 80 high, is a most remarkable structure. When it is considered that in the campaigns of Napoleon trestle bridges of more than one story were regarded as impracticable, and that, too, for common military purposes, it is not difficult to understand why distinguished Europeans should express surprise at so bold a specimen of American engineering. It is a structure which ignores all the rules and precedents of military science as laid down in books. It is constructed chiefly of round sticks cut from the woods, and not even divested of bark; the legs of the trestles are braced with round poles. It is in four stories—three of trestles and one of crib-work. It carries daily from ten to twenty heavy railway-trains in both directions, and has withstood several severe freshets and storms without injury. This bridge was built in May, 1862, in nine working days, during which time the greater part of the material was cut and hauled. It contains more than 2,000,000 feet of lumber. The original structure which this replaced required as many months as this did days. It was constructed by the common soldiers of the Army of the Rappahannock under the supervision of Gen. Herman Haupt, chief of the bureau of construction and transportation U. S. military railroads."

In general dimensions, however, this timber structure was surpassed by one erected under very different circumstances by skilled artisans and in a much longer time. It is known as the Portage Bridge on the New York, Lake Erie, and Western Railroad, over the Genesee River, and is 800 feet long and 234 high, the masonry being 30 feet high, trestles 190, and trusses 14. The timber piers, 50 feet apart, were estimated to support 3000 tons, besides the weight of the structure. The general plan was made by Silas Seymour, chief engineer. This bridge was begun July 1, 1851, and completed Aug. 14, 1852. It was burned down May 6, 1875, but was immediately replaced by an iron trestle, which is quite as remarkable for the rapidity with which it was erected. (See fig. 49.) The description is best given by the following extract from the *Transactions* of the American Society of Civil Engineers, 1876:

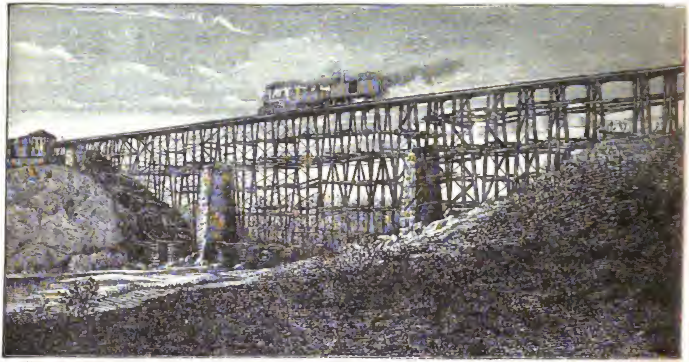


FIG. 48.—U. S. Military Railway Department Trestle Bridge, across Potomac Creek on Fredericksburg R. R., Va.

"On Monday, May 10, 1875, the contract for the iron-work was let to the Watson Manufacturing Company of Paterson, N. J., the bridge to be built according to plans of George S. Morison, C. E. The first iron column was raised June 13th. On July 29th the iron was all in position; on the following day the track was laid across, and on Saturday, July 31st, *forty-two working days*, the bridge was tested and thrown open for traffic. The total weight of iron in the bridge is 1,310,000 pounds. The main principle of the plan may be said to be that which characterizes all American bridge-building, and is the leading difference between the works of American and European engineers—the concentration of the material into the least possible number of parts.

"The iron viaduct has ten spans of 50 feet, two of 100 feet, and one of 118 feet, a 50-feet span being placed between each of the long spans. The trusses are supported by wrought-iron columns, the ends of two adjacent trusses resting upon a single column. The pair of columns supporting the opposite trusses are in the same vertical plane, but are inclined towards each other and connected with wrought-iron struts 25 feet apart, and diagonal tie-rods, thus forming a two-post bent; each column is connected with the parallel column of the adjoining bent by a similar arrangement of struts and diagonal ties; four columns with the connecting bracing are thus made to form a skeleton tower 20 feet wide and 50 feet long on the top, surmounted by a 50-feet span of bridge, having the same length at the bottom and a width varying with the height of the tower. There are six of these towers, the largest having a total height from masonry to rail of 203 feet 8 inches.

"The trusses of the superstructure are proportioned to carry a moving load of 3000 pounds per running foot, and an excessive load of 5000 pounds per foot, with a maximum tensile strain of 10,000 pounds per square inch. The towers are built to carry a moving load of 5400 pounds per running foot (being designed for two tracks); they are also calculated to resist a wind-pressure at right angle to the bridge of 30 pounds per square foot, exerted on the entire surface of the structure, and of a train of cars, and one of 50 pounds per square foot exerted on the surface of the structure alone.

"The columns rest upon cast-iron pedestals, those on the north side of the bridge being secured by dowels to a cast-iron plate sunk in the masonry, and those on the south side being placed on rollers rolling at right angles to the axis of the bridge. The columns are made in 25-

feet lengths. They are formed of three plates and four angle-irons, with a lacing on the fourth side, so that the interior of the column is accessible for painting. The angles are all 4×4×½ inches, and the plates are all 16 inches wide; the thickness of the side plates being varied to provide for the increased strains in the lower sections. The ends of the several lengths are squared and faced, and they rest directly upon one another without joint-boxes; the upper end of each length is fitted with two projecting plates which form a tenon; the length above fits over the tenon-plates, and is secured to the lower length by a turned pin of 1⅞ inches diameter passing through carefully bored holes; this same pin serves for the attachment of the longitudinal rods. A second pin at right angles to this one forms the attachment for the transverse strut and ties. The diagonal ties are everywhere in pairs. The longitudinal strut, which is nearly 50 feet long, is built in the form of a light lattice truss, is 2 feet deep and 1 foot wide, with the ends squared and butting against the side of the column.

"The towers were raised with no other false-work than that actually used in handling the material of each successive section. Before beginning to raise a tower a floor of long timbers reaching from pier to pier and loose boards was laid at the site of the tower; on this floor was erected a framework 30 feet high, and composed of two bents, one on each side of the tower; each bent consisted simply of two posts 48 feet apart and a cap 55 feet long, braced with planks across the corners. The lower lengths of the columns were then lifted into position, the transverse and longitudinal struts put in place, and the diagonal ties put on. A gin-pole 55 feet high was then lashed to each column, and these gin-poles were used to transfer the floor and frame to the top of the now completed lower section of tower. The same operation was then repeated with the second lengths of columns, which were placed over the tenon-plates of the lower length and secured by the pins. When the second section of the tower was completed, the frame was used to raise the gin-poles; the floor and frame were then raised again, and the process repeated till the tower attained its full height. The last tower raised, weighing 277,000 pounds, was entirely erected in eleven days, one day only having been previously spent in preparing the staging for the first section.

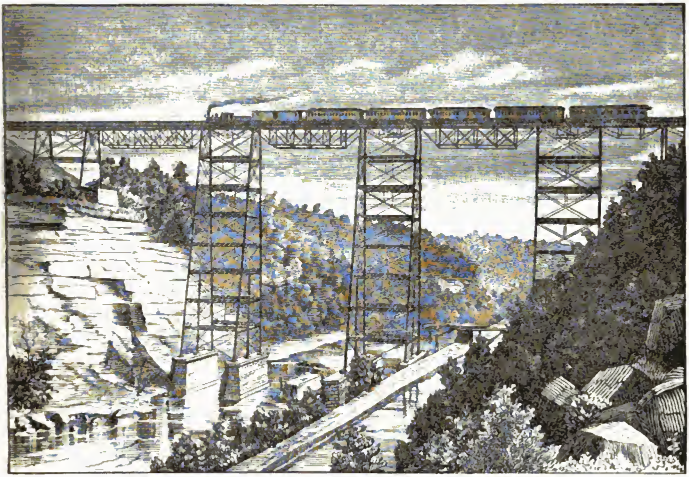


FIG. 49.—Iron Viaduct over the Genesee River, N. Y., on the New York, Lake Erie, and Western R. R.

"To erect the long spans combination Pratt trusses were built, the top chords of which were made of four pieces of pine 4×10 inches, packed in pairs, and sprung about 4 feet apart in the centre; the bottom chord was of straight parallel eye-bars and the posts V-shaped. The form of the top chord made the truss stiff without lateral bracing. These trusses were put together below, and raised by block and falls to the bottom of the upper section of the towers, where they were placed, resting upon the transverse struts, two being used for each span. A suitable staging was then erected on them, and the permanent truss was put together, the materials being run out from the end of the bridge.

"The trusses are of the simple Pratt pattern. One end of each long truss is bolted to the iron capital of the column, and the other is placed on rollers, but connected with the next truss by iron loops passing over the end pins of each span, and allowing only the amount of motion needed for expansion. The short spans over the truss are bolted to the capitals at both ends. The end pins of the 50-feet spans are placed 6 inches from the centre of the column, and those of the long spans only 3 inches, so that under a full load the centre of weight comes directly in the line of the centre of the column."

The Verrugas Viaduct (fig. 50), completed in 1873, under the supervision of Mr. C. H. Latrobe, C. E., with Mr. W. W. Evans of New York as consulting engineer, is situated on the Oroyo Railroad in Peru, It crosses the valley of the Agua de Verrugas at a height of 5478 feet above sea-level. The structure is composed of three iron piers connected by Fink trusses, and is remarkable for the rapidity and cheapness of its construction. The piers are respectively 145, 252, and 177 feet high, and each 50 feet long by 15 feet wide at top, having a batter of $\frac{1}{12}$. Three of the spans are 100 feet long in the clear, the remaining one being

125 feet, making the total length of the bridge, with piers, 575. The erection of the iron-work was begun Sept. 17, 1872, and completed before the first of the year, or in eighty-eight working days, without the slightest accident to any of the men. The grade on the bridge is 158 feet per mile, and trains pass from a curve of 350 feet radius directly on to the viaduct. The total cost was $164,640. The erection was accomplished by stretching wire ropes across the chasm, from which a scaffold was suspended.

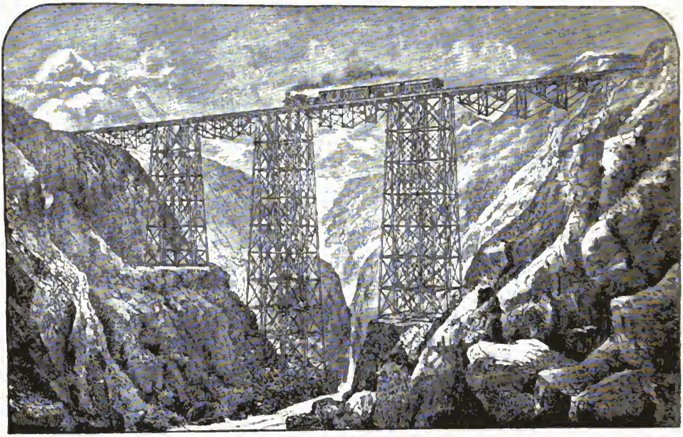


FIG. 50.—Verrugas Viaduct, Oroyo R. R., South America.

An extensive iron viaduct has just been completed on the Galveston, Harrisburg, and San Antonio Railroad over the Rio Pecos in Texas, having an extreme height of 302½ feet and length of 1662 feet.

But the most recent, as well as most remarkable, construction of this class is the Kinzua Viaduct, which is said to be the highest viaduct in the world. It forms part of a branch of the Erie Railway into the coal-fields of Elk co., Pa., and its construction was found to be the most economical way of crossing the Kinzua Gorge, a long-time obstacle in the way of railroad construction. Surveys and investigations leading to the conception of this work were made by Mr. O. W. Barnes, chief engineer of the road before it passed into the hands of the Erie Railway. It was built according to Erie Railroad specifications by Messrs. Clarke, Reeves & Co., under Mr. O. Chanute, chief engineer. It contains 3,500,000 pounds of iron, and cost $275,000. The foundations consist of one hundred and twelve sandstone piers laid upon rock, shale, and gravel. The few below the level of the stream are founded on timber cribs.

The following data will give a good idea of the magnitude and strength of this viaduct:

Total length	2052 ft.
Height of rail above stream	301 "
Number of towers	20
Height of iron-work of lowest towers	16 ft.
" " highest "	278'3".
Length of girders over towers	38½ ft.
" " between " (spans in the clear)	61 "
Width of towers at top	10 "
" " bottom	10 ft.+⅓ of height
Live load "Consolidation" engines in any position:	
Equal on each column of tower at top	76,500 lbs.
Dead load on top of each column	22,950 "
" " each story per column, about	5,000 "
Girders, calculated for a train of "Consolidation" engines:	
Chords strained in tension, per sq. in. of net section	8,000 lbs.
Chords strained in compression, per sq. in. of gross section	7,000 "

Diagonals, strained per sq. in. from 5000 to 7000 lbs.
Rivets, " " 5000 lbs.

WIND-PRESSURE.

Maximum compression, structure loaded:

Pressure assumed at the top of each bent	20,000 lbs.
Additional pressure at each story of tower	1,980 "

Maximum tension, structure unloaded:

Pressure assumed at top of each bent	15,000 "
Additional pressure at each story of tower	3,300 "
Strains allowed on "Phœnix" columns, of the length used (16 to 33 feet), with an ultimate strength per sq. in. of	35,000 "
Maximum compression from live load, per sq. inch	7,000 "
Maximum compression from wind-pressure, per sq. inch	10,000 "
Greatest strain for combined loads	8,000 "
Maximum tension on diagonals (rods)	15,000 "
" strains on struts	2 to 3000 "
" tension on anchor-bolts	12,000 "

ERECTION.

The cost of erecting large bridges over treacherous streams has been a serious obstacle to the opening of important avenues of communication; but modern skill and science have overcome this objection in a great measure by devices which no longer render it necessary to construct an auxiliary bridge upon which the permanent structure may rest during erection. The various methods of erection are—1st, by use of staging; 2d, by lifting bodily; 3d, by protrusion or rolling over; and 4th, by building out.

In the first and most common method for iron or wooden trusses (in fact, the only one in use up to 1848) foundations are formed by driving piles, either in rows or clusters, to a sufficiently hard substratum, and capping them with a temporary scaffold or staging, which is "blocked up" to the grade of the lower string-piece, and upon which the entire bridge is assembled. Occasionally the foundation for the staging may be upon temporary "cribs," which are sunk in the river, and upon which the trestles are placed; or the staging may consist of a light iron or wooden truss supported by chains, as in the erection in 1866 of the bridge at El Kantara, in Algeria.

A light iron lattice supported on clusters of piles was used in the erection of the railroad bridge over the Inn at Königswart in Bavaria, with three spans of 227 feet; but the intermediate piles of the middle span were swept away by a flood, necessitating the substitution of a temporary wrought-iron framework, erected by overhang, its panels advancing from the piers at each side and meeting midway.

The first digression from the method involving staging was introduced at the Britannia tubular bridge in 1848. The four tubes were constructed on shore upon a platform 2200 feet long built on piles spaced 27 feet apart. On the completion of the first tube, 472 feet long, six pontoons, each being 98 × 25 × 8 feet, were placed beneath it, so that the rising tide should lift the tube clear of its bearings. By means of capstans the tube was then swung into the vertical plane between the piers, in which grooves had been left to receive it. When adjusted in line, water was let into the barges and the tube lowered upon its masonry bearings. Heavy chains having links of 6 feet, equal to the stroke of the rams, were then attached, and the tube raised that height whilst the masonry was laid up under it. The cross-section of the chain was 276 square inches. The maximum strain, 8·3 tons per square inch. It required from thirty to forty-five minutes for each 6-foot lift, but only one lift was made each day, and about a month was consumed in elevating each tube to the full height of 100 feet and fixing it in place. The cost of erecting the tubes, weighing in all 11,647 tons, was $316,900, or about $27.25 per ton, whilst the cost of the tubes themselves was, for material and workmanship, about $162 per ton. (See fig. 51.)

The bridge at Saltash designed by Brunel was erected in 1859 in a similar manner. The two larger spans are each 455 feet, and the height of the roadway is 100 feet. The railway bridge over the Weser near Bremen (1867), and the great bridge at Moerdyk in Holland, having fourteen spans of 328 feet each, were also completed in this manner.

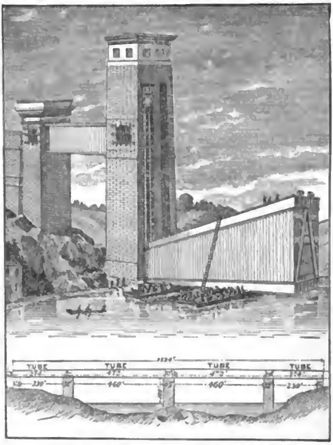


FIG. 51.—Erection of Britannia Tubular Bridge, Wales.

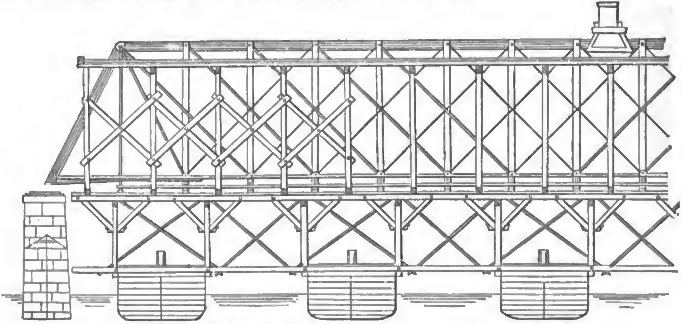


FIG. 52.—Floating Staging used at the International Bridge over the Niagara River, U. S. A.

The superstructure of the International bridge over the Niagara River, comprising a large number of spans varying from 197 to 248 feet, was placed in position by the aid of a floating staging carried by five pontoons. (See fig. 52.)

The reverse of this method of erection was illustrated in the placing of James Millholland's bridge, previously described. When completed, this bridge was coupled at each end to a railway-car, and was slung by chains to a temporary timber truss. It was then taken nineteen miles from Baltimore by rail, run exactly over the place it was intended to occupy; the existing timber bridge was cut away, and the girder lowered with the permanent way ready for traffic, the whole operation having caused a delay of not more than two hours. The general elevation of the plant, omitting the engine, is shown in fig. 53.

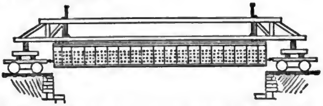


FIG. 53.—Lowering of a Tubular Bridge into place (1847).

Erection by rolling over requires a predetermination of the strains, not only for the completed girder, but for its various intermediate positions as a cantilever, and requires the highest attainments of science and art. The principle seems to have been first applied in the placing of the Sarine Railway viaduct at Freiburg, where the roadway was constructed on the hill behind one of the abutments, and was pushed bodily forward upon rollers placed on piers over successive openings of 160 feet. This method, however, is applicable only to continuous girders, or to the replacing of old bridges by new ones built alongside and rolled over laterally. It was used at the St. Just road-bridge over the Ardèche, spans of 152 feet, in erecting the temporary staging for the arched wrought-iron ribs.

Erection by Building Out.—The famous steel arched bridge spanning the Mississippi River at St. Louis (opened 1874) furnishes a striking instance of this method of construction (fig. 54).

This bridge was built by the Keystone Bridge Co. under the direction of Capt. James B. Eads and his assistants, Col. Henry Flad, Charles Pfeifer, and Walter Katté. The twenty-four arches were made of chrome steel, manufactured by the Midvale Steel Works at Philadelphia. Each arch is composed of straight sections of tubes about 12 feet long, having an exterior diameter of 18 inches and a thickness varying from 2¼ inches at the springing to $1\frac{1}{8}$ at the crown. The ends of the sections are bevelled and joined by steel or wrought-iron sleeve-couplings, through which steel pins are passed to receive the feet of the main brace-bars. The lowest sections are screwed into wrought-iron skew-backs, which rest on heavy cast-iron bed-plates anchored to the masonry. About 2200 tons of steel and 3400 tons of iron are used in the whole bridge. The west span is 504·07 feet; the east, 504·84 feet; and the centre span, 522·39 feet, measured on a line through the centre of the lower skew-back pins. The upper roadway is 54 feet wide.

The original intention of the contractors was to erect by the aid of guys depending from the masonry and by cables passing over temporary towers. Capt. Eads urged the use of catenary cables extending over towers placed on the piers and abutments and anchored at the approaches. Investigations showed that this method would be expensive and uncertain. The difficulty of maintaining these cables in the assumed curve, when supporting the constantly varying weight of the arches as they progressed from the abutments and piers, led Mr. Linville to propose, early in 1871, in his instructions to Walter Katté, engineer in charge, the use of direct guys and back-stays depending from temporary towers. These suggestions embraced the leading principles of erection adopted, securing direct support to the arches at a certain number of fixed points. It was subsequently suggested by Col. Flad to use guys passing over towers, the guys or cables being made adjustable by means of hydraulic rams placed on the summit of the towers, to compensate for changes of temperature. The officers of the Keystone Bridge Co., fearing accidents to the rams and difficulty in repairing the same, substituted *movable towers* supported on the rams, which were placed on the masonry. The scaffolding *on top* of the arches was used in erecting the cables and for the purpose of maintaining them in straight lines. The erection was commenced at the west abutment and at each side of the first pier. The cantilevers on opposite sides of the pier balanced each other. The sections of the arches were hoisted from boats, and added in succession until the semi-spans met, and were made self-supporting by the insertion of the closing tubes. During the entire erection the rams were operated automatically by means of a balance-gauge and proportional weights, to compensate for variations in the lengths of the cables due to strains and thermal changes.

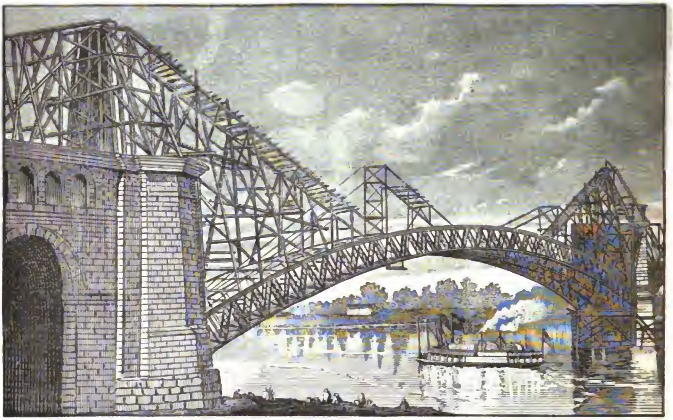


FIG. 54.—Illinois and St. Louis Highway and Railroad Bridge.

The bridge is pronounced by all to be the finest mechanical specimen of work in the world. The method of erecting these immense steel tubes, without any of the usual appliances of scaffolding or support from below, is shown in the illustration, copied from a photograph.

All the adjustments were made with the greatest accuracy, and the arches were all closed in the centres of the spans by the use of "extension"-tubes capable of being lengthened or shortened by means of solid wrought-iron cylinders filling the interior of the tubes and furnished with right- and left-handed screws. The bridge was publicly opened on July 4, 1874, and the cost, including a large amount of interest and commission accounts, was not far from $10,000,000.

It is worthy of note incidentally that as early as 1833, Maj. Ellett proposed a wire suspension bridge for this site at an estimated cost of $600,000, but his proposal was rejected because of the "immense cost."

The Douro bridge, near Oporto, Portugal (fig. 55), also furnishes a remarkable instance of the mode of erection by building out, as well as novelty in design of long-span bridges.

The foundations for the iron piers were built of granite quarried on the spot. On these were erected the iron piers, composed of four corner posts with the usual sway-bracing. The lattice truss proper was then built on the plateau by additions to the shore ends, and pushed out across their apices as a continuous girder until it overhung the channel-span 105 feet on either side, when the erection of the arch was begun at the springing lines, and continued up and out, panel by panel, by tying up to the cantilevers projecting overhead by means of wire ropes passing over the piers. The skew-backs of the arch are four heavy cast-iron plates securely bolted to the masonry; and the two at either end are so placed that the distance between them is double that between the girders on the crown of the arch, thus adding to the lateral stiffness of the structure. The ends of the arch are hinged on the skew-backs. The guy-ropes were moved out as the work progressed, and continued to support the arch until the lower ribs met in the centre. On the completion of the arch two short iron piers were erected on its haunches to support the truss over the spandrels, and over these the lattice was extended to the crown.

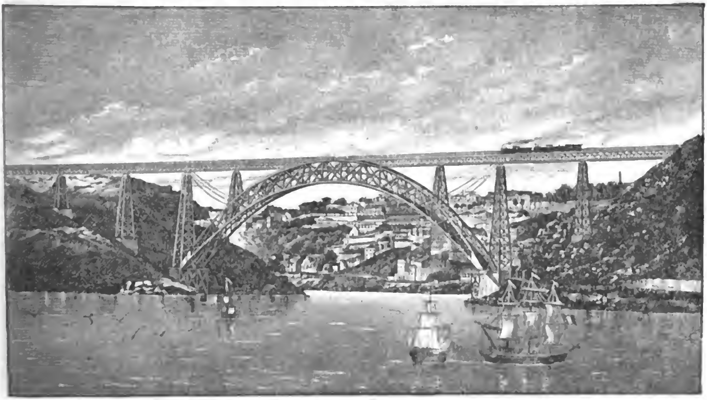


Fig. 55.—Railway Bridge across the River Douro, near Oporto, Portugal.

The iron was manufactured in Paris. The total length of the bridge is 1150 feet; span of arch, 520 feet; height from low water to crown, 198 feet. The time required to complete the structure was a little more than two years, and it was opened for travel in Nov., 1877, by the king of Portugal.

One of the most remarkable instances of rapid and bold erection is to be found in the construction of the Kinzua viaduct, already mentioned (figs. 56, 57).

The 1750 net tons of iron were distributed and erected between May 5 and Aug. 29, 1882, or in less than four months, by a gang averaging about 125 men, aided by two steam-hoists and about twenty-five miles of rope. No scaffolding was used, but the girders were put in position by a travelling crane moving over the completed portions of the structure. In setting up the towers four masts 60 feet long were placed at the corners, by the aid of which the first story of 33 feet was completed. Four gin-poles, each 60 feet long, were then braced to these corner-posts about halfway up, and the posts and braces of the second story hoisted and bolted in place. This operation was repeated until the last story was reached, which was raised and swung in place in two pieces by an overhanging travelling crane, which also handled the 61-foot girders, weighing 6 tons each.

The workmen climbed the diagonal rods, which were in pairs, and then walked the horizontal struts with perfect freedom, and even recklessness. There were no serious accidents during the erection, and it was not necessary to use a punch or chisel on any part of the work, so perfectly had the parts been fitted in the shops.

On one of the highest towers it required just three hours to hoist the last section, 287 feet, into place, swing out a 61-foot girder, go back 1000 feet for the second girder, put it in position, make connections, and put in the transverse bracing,—all with a gang of twelve men. About one day was required to raise and connect one story and put the gin-poles in position for the next one, at a height of 150 feet. The time required to complete the entire structure from the laying of the foundations was about eight and a half months, whilst that required for the Göltzsch Valley masonry viaduct was five years and two and a half months. Before final adjustment the towers came to centre-line within half an inch.

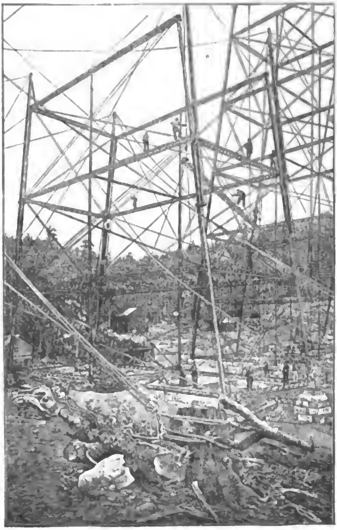


Fig. 56.—Erection of the Kinzua Viaduct, on the New York, Lake Erie, and Western R. R.

The iron received one coat of paint in the shop and two in the field. The composition of the paint was—

Oxide of zinc, 70 per cent.
White lead, 30 "
7½ gallons of best linseed oil.
¼ " of liquid dryer.

(For dimensions and general description see paragraph under PILE-BRIDGES.)

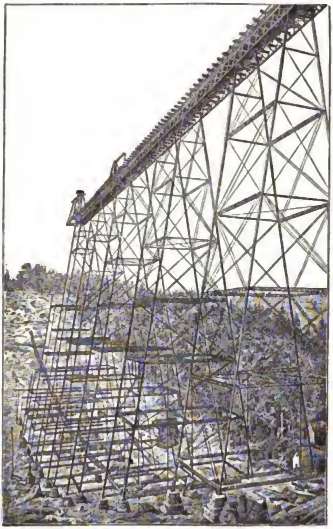


FIG. 57.—Kinzua Viaduct, on a branch of the New York, Lake Erie, and Western R. R., near Bradford, Pa.

SPECIAL FEATURES OF SOME AMERICAN BRIDGES.

A modified form of Pratt truss as constructed by Kellogg & Maurice consists of square panels having the middle point of the lower chord supported by a tie extending to the top of the adjacent post on the side towards the pier. This enables the section of the lower chord (which is of wood) to be reduced at the extremities of the truss in proportion to the stresses. The upper chord is composed of four pieces throughout.

St. Paul Highway (see fig. 58).—As early as 1854 it was proposed to bridge the Mississippi at St. Paul by a series of trusses in which the channel-span should not be less than 300 feet. The span, as constructed in 1858, was reduced to 240 feet, then a "long span;" but the peculiar feature of this bridge consists in the fact that its roadway is built upon a grade of $\frac{1}{20}$ up to the channel-span, where it is $\frac{1}{25}$, caused by the bluffs, about 125 feet high, on the left (there the west) bank of the river. The eastern approach consists of an embankment 1600 feet in length, followed by 375 feet of trestling in bents 30 feet apart; then seven spans of 140 feet each, succeeded by the channel-span of 240 feet; and a short span of 80 feet, over the St. Paul and Omaha Railroad, to the top of the bluff. The piers are built in steps, so that each truss is 7 feet higher than its predecessor, and the roadway is supported on the top chords by bents. The short spans are of wood. The channel-span, of iron, 63 feet above high-water, was rebuilt in 1875-76. It was designed and erected by J. S. Sewell, C. E. All the short spans were rebuilt in 1870.

The Rock Creek bridge (fig. 59) was designed and executed about 1860 by Gen. M. C. Meigs, U. S. E. It was unique in form as well as purpose, serving as it does for both viaduct and aqueduct. The arch supporting the roadway and spandrels is composed of cast-iron circular pipes of 48 inches internal diameter and 1½ inches thick, having flanges at the ends of each of the seventeen sections, by which means they are bolted together. The clear span of the arch is 200 feet and the rise 20 feet.

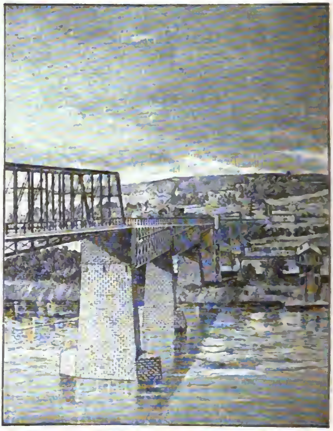


FIG. 58.—St. Paul Highway Bridge, Mississippi River, Minn.

The tubes were at first jacketed with oak staves, to prevent the water from freezing, but this jacketing caused so great an expansion as to produce leakage, and was afterwards removed without injury to the pipes from thermal changes. The bridge is on Pennsylvania avenue between Washington and Georgetown, D. C., where it is subjected to a large amount of travel.

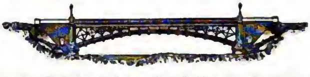


FIG. 59.—Highway and Aqueduct Bridge over Rock Creek, Washington, D. C.

A similar structure was subsequently erected with a span of 120 feet over College Branch on the Washington Aqueduct.

The distinguished engineer Mr. C. Shaler Smith has constructed several bridges of such original design as to deserve mention in this article. The first we shall notice is in the Royal Gorge of the Arkansas, on the Denver and Rio Grande Railroad, in Colorado, erected during the summer of 1879 (see fig. 60).

It is a continuous plate girder in three spans, 275 feet long and 7 feet deep, which is suspended by rods from "arch-braces" spanning the chasm at a height of 47 feet. On either side the walls of the cañon rise almost perpendicularly 1800 feet, and the entire river, contracted into a width of 50 feet, flows beneath with a fall of 6 feet in the length of the bridge, which is parallel with the stream. The bridge has a grade of 3 feet per 100. As the two middle supports are *yielding*, it required very delicate computations to determine the stresses, and ingenuity to provide for thermal changes. The erection of the arch-braces in a position so inaccessible is said by the engineer to have been almost as difficult as the erection of the Kentucky River bridge.

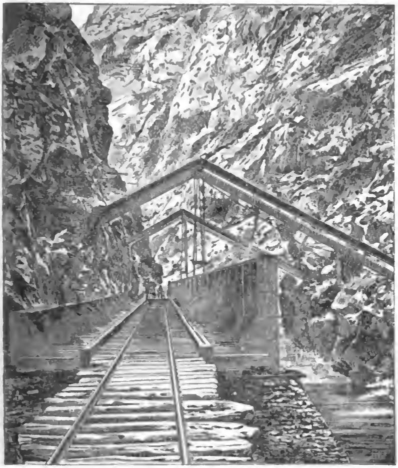


FIG. 60.

The Minnehaha bridge (fig. 61) on the Chicago, Milwaukee, and St. Paul Railroad is a continuous girder on four supports, of which the two middle ones are yielding and variable. The effects of temperature and load on the piers are eliminated by hinging the middle span at the centre; the bottom chord is a stiff member, and is continuous from end to end. The principal feature of this bridge is the *rocker-pier* system. At the Kentucky River bridge the piers were fixed, and their tops connected with the truss. The bending strains arising from a train of 1000 tons being brought to rest on the bridge in a space of 100 feet when the middle span was expanded to its utmost from temperature, were then calculated, and the material necessary to resist these strains was added to the columns and braces of the piers (see fig. 62); whilst at Minnehaha the pier is a single post hinged at the top (*a*, fig. 63), and having a rocker-bearing below, *of which the radius is the height of the pier*. In other words it is precisely the same as though the bridge were on wheels, and all of the wheel cut away except one spoke. The entire bridge is free to expand at both ends, but up to twenty-one months from the date of its completion (July, 1880) it had moved only half an inch either way. There are ultimate stops to too great a play. This principle, which admits of a great reduction in the amount of masonry, was first introduced by this engineer in 1871 at the Rock Island bridge over the Mississippi.

AMERICAN *vs.* EUROPEAN PRACTICE.

The characteristic differences between American and European methods of bridge construction may be briefly stated to be (*a*) the use of pins in place of rivets; (*b*) the assemblage of the pieces, so far as possible, in the shop, rather than at the site of the structure; (*c*) the reduction of the number of members to a minimum by the use of open trusses composed of simple systems, rather than the plate, tubular, or closely-latticed girders of European engineers, thus offering less resistance to wind-pressure; (*d*) the consideration of the stresses due to violent wind-storms (pressure varying from 40 to 56 pounds per square foot, as well as of the area upon which it impinges, being taken at double that of the vertical projection of the truss), whilst in Europe no well-defined rules seem to exist for the determination of the wind-strains, some countries using very low (ordinary) velocities, whilst others neglect it altogether, with such disastrous results as occurred at the Tay bridge in 1879; and finally (*e*) the ratio of depth to length of span, the practice in America being in favor of deep trusses.

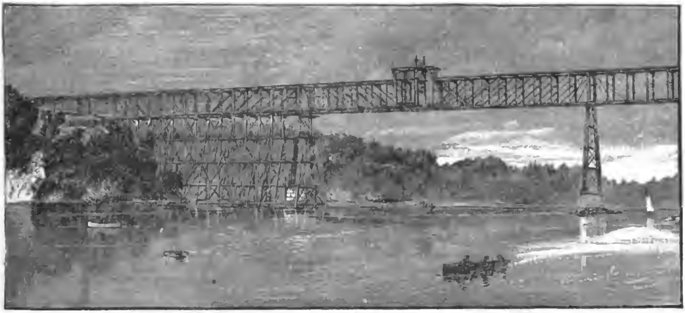


FIG. 61.—Minnehaha Bridge, on Chicago, Milwaukee, and St. Paul R. R.

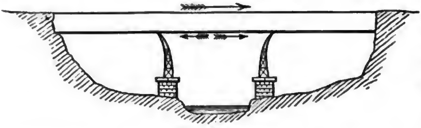


FIG. 62.

These differences lead directly to many important results, concerning which Ernst Pontzen, a distinguished Austrian engineer, remarks: "A bridge built on the American plan will always offer more safety than one built on the European plan, even though the maximum theoretical strength of both may be the same.

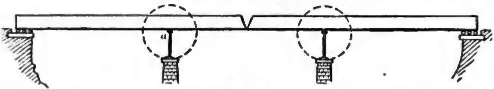


FIG. 63.

The variations from the calculated strength will be different in the latter, according to the care bestowed upon the work in the place of construction, while this will not be the case in American bridges, in which the same care is bestowed in the shops on the length of the various elements and the holes for the bolts, which are accurately drilled. With the same safety the trussed bridges of America may be made lighter, as well for the reasons already given as for the absence of the joints and packing-plates which are necessary to strengthen the weakened parts in riveted trusses and at the ends of tension-rods, as also to prevent warping." . . . "But the main argument in favor of the trusses with bolt and pin connections is the fact that a great advantage is gained by means of the lighter, quicker, and less expensive construction."

The latest American practice in the construction of iron bridges is best exemplified by that of the Pennsylvania Railroad Company.

> It has adopted the system of using "solid rolled I-beams for all short spans, up to such lengths as they may be available for the required live loads; then plate girders to spans of 50 to 60 feet, and in some cases even 70 to 80 feet, above which they become too wasteful and expensive in material, and are replaced by open trusses.
>
> "In small *deck* bridges the general practice is to use two I-beams under each rail of the track; then for longer spans up to 30 to 50 feet, where 'built' girders are employed, to place one girder under each rail; and as the span increases to adopt only three girders or trusses for two tracks, spacing them so that when both tracks are loaded each truss will carry the same weight.
>
> "In *through* bridges for double track, with three trusses, the centre truss sustains double the load of either outside truss." (*Jos. M. Wilson, C. E.*)

FACTORS OF SAFETY.

It has been the practice to assume some maximum load as being the greatest to which the bridge can ever be subjected, and then, to insure absolute safety, so to increase the dimensions of the members as to reduce the unit strains to from one-sixth to one-tenth of that necessary to produce rupture. This increment of strength adds also to the weight of the structure, as well as to the cost, and is at best an imperfect method of making liberal allowances for such contingencies as may arise from imperfections of material or manufacture, and from shocks produced by any external forces. Frequent experiments upon the strength of materials have enabled constructors to determine not only the ultimate breaking strains, but, what is of far greater importance, that limit of strength beyond which the material cannot be strained without producing a permanent set or change of form under the application of a given load at frequent intervals of time. This limit is known as the limit of elasticity, and it is now regarded as the vital point in preparing materials for bridges, that it shall be greater than that produced by any possible strain to which a member can be subjected. In a combination bridge, therefore, as of wood or iron, or of various grades of iron or of steel, the absurdity of the former practice of applying a constant factor to all the members of a truss becomes at once apparent, and the necessity of proportioning each member so as best to resist its individual strains, and keep them within the elastic limits of the material of which that member is composed, is evident.

In former specifications the ultimate strength of wrought iron was required to be from 55,000 to 65,000 pounds per unit, and the elastic limit would perhaps reach 20,000 pounds, or about one-third the breaking strength; whilst at present the elastic limit is increased to about 25,000 pounds, whilst the ultimate strength may be as low as 45,000 to 50,000.

So soon as the load on a structure produces a strain beyond the elastic limit of any indispensable member, just so soon will its destruction become merely a question of time. Mr. O. Chanute, C. E., chief engineer of the New York, Lake Erie, and Western Railroad, is authority for the following distribution of safe working loads on the several members of a bridge:

> "Late specifications have pretty well discarded all mention of a 'factor of safety,' and we now limit the strains to certain numbers of pounds per square inch upon each of the several parts of bridges, in accordance with their position and importance in the structure, and more particularly the frequency with which they are likely to be strained up to the calculated maximum amount.
>
> "Thus, for *floor-beam hangers*, which are sure to be loaded to the full calculated amount by the passage of nearly every locomotive, and which have no chance to stretch gradually, both by reason of their short lengths and because of the sudden application of the loads, we generally limit the tensile strains to 6000 or 7000 pounds to the square inch. Upon the bottom flanges of *riveted plate-girders*, which are also strained nearly to the full calculated amount by every train, and in which riveting is frequently imperfect, we limit the strains to 7000 or 8000 pounds per square inch, while we admit 10,000 pounds upon the bottom flanges of *solid rolled beams*, where no such imperfections are possible. On *bottom chords*, *main ties*, and *main diagonals*, which can only be strained to the calculated amounts when the bridge is loaded with the assumed maximum train, which generally consists of locomotives or of two of the heaviest engines followed by a train of the heaviest cars in the service, and which, as they advance, impose gradually their strains, we limit the latter to 10,000 pounds to the square inch; while on the *lateral bracing ties*, which cannot be loaded to the calculated amount unless the wind blows a hurricane and a train is standing on the bridge at the same time, we admit strains in tension of 15,000 pounds to the inch.
>
> "The above all refer to tensile strains. In compression members we follow the same general practice, and limit the strains to 5000 or 6000 pounds to the square inch on the top flanges of *riveted girders*, and to 10,000 pounds for *solid rolled beams*, while we calculate *top chords*, *posts*, and *struts* by formulæ which result in strains of about 8000 pounds to the inch for 1 diameter, down to 4000 pounds for 70 diameters.
>
> "With these proportions, involving, as will be seen, quite a number of different 'factors of safety,' we assume that our bridges are equally strong and safe in all their parts; but we are still learning by experience and modifying our views year by year. It must be admitted that our knowledge of the strength and safe loads upon compression members is as yet very deficient and imperfect. It has been mainly obtained by experiments upon small pieces; and for want of sufficiently powerful machines to test full-sized compression members, we know very much less about their behavior than about that of tension parts, which, being generally subdivided into a number of parallel pieces, we have been enabled to test with quite satisfactory accuracy.
>
> "There is, at last, one machine in the United States—that of the Government at the Watertown Arsenal—which is capable of testing full-sized compression pieces, and we may reasonably hope that important results and information will follow from its use. It is understood that the officers in charge are authorized to make tests for parties who may apply at actual cost, which is about $16 per day. As such experiments should be made upon a uniform plan, it is much to be hoped that Congress will make an appropriation for a series of experiments upon compression members of various shapes, lengths, and materials. There is reason to believe that the results of such experiments may lead to important changes in our current bridge-practice, and materially add to the safety of our bridges."

The British rules for standard working loads are as follows:

"1. The working load for railway-bridges 400 feet in length and upward does not exceed ¾ ton per running foot on each line.

"2. No more locomotives than will cover 100 feet in length follow each other without interruption; hence, the working load per foot diminishes as the span increases from 100 up to 400 feet.

"3. Engines may be arranged on bridges less than 100 feet long so as to produce greater strains than could be due to the engine-load if it were of uniform density; hence, the equivalent working load per foot increases as the span diminishes from 100 feet downward.

"4. Bridges less than 40 feet in span are subject to concentrated loads from single engines, as well as to extra deflection from high-speed trains.

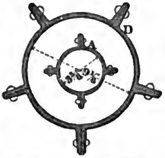


FIG. 64.—Phœnix Wrought-iron Columns.

"5. The standard locomotive is assumed to be 24 feet long, and to have six wheels with a 12-foot base—to have half its weight resting on the middle wheels and one-quarter on the leading and trailing pairs respectively.

"6. Standard engines are assumed to weigh from 24 to 32 tons. This makes the standard load vary from 1 to 1¼ tons."

No definite rule has been made by the Board of Trade for the proof load of railroad bridges, but the common practice is to load the bridge with engines and measure the deflection. For common road bridges Mr. Stoney has found by experiment that it is possible so to condense people in a crowd that each person will require but one square foot of standing room, and will produce a statical pressure of about 150 pounds; but this is an extreme case; the practice is to allow 100 pounds per square foot of floor-surface.

The standard proof load in France for suspension bridges was 41 pounds per square foot, but it has recently been doubled, and the strains on members of truss bridges are limited to about 8535 pounds per square inch. In Germany the strains are about 10,000 pounds to the inch.

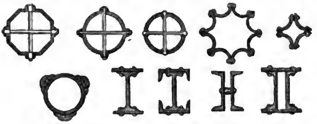


FIG. 65.—Sections of Keystone Columns.

In determining the safe load of bridges due regard must be paid to the ratio existing between the live and dead load. It is customary in both Europe and America to regard a live load as twice as injurious as a dead one, and hence the aggregate load is obtained by adding the weight of the bridge per lineal foot to twice that of the greatest weight on drivers of engine. This latter unit varies according to the service required and style of engine, but to insure safety all bridges should be so proportioned as to carry the heaviest engines manufactured, and to leave a liberal margin for future increase in weight of rolling stock.

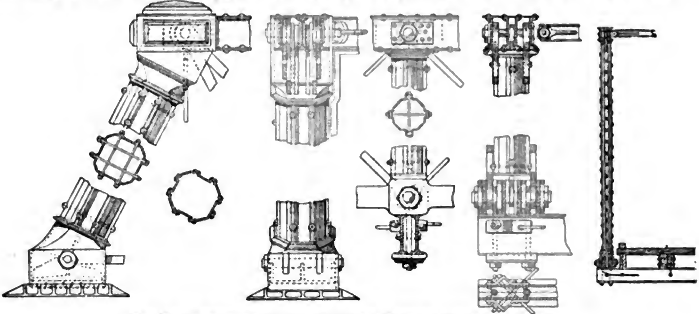


FIG. 66.—Connections for Through Bridges, Keystone Bridge Co., Pittsburg.

The general rule, however, must not be applied indiscriminately to bridges of any span, as it is evident that the relation between the length of wheel-base, concentration of load over same, and length of span will influence to a large extent the stress upon the several parts of the structure.

The following exemplification of the best American practice is that of the Messrs. Wilson Bros., engineers of bridges on the Pennsylvania Railroad, giving the equivalent uniform load per lineal foot:

Span.	Load.	Span.	Load.
5 feet,	4·80 tons.	18, 19 feet,	2·55 tons.
6 "	4·00 "	20, 21 "	2·50 "
7 "	3·40 "	22-27 "	2·40 "
8 "	3·00 "	28 "	2·30 "
7 "	2·90 "	32 "	2·00 "
10 "	2·80 "	40 "	1·83 "
11-13 "	2·70 "	48 "	1·70 "
14-17 "	2·60 "	64 "	1·52 "

For any greater span the load is 1·50 tons per lineal foot. The maximum concentrated load for different spans, as applicable to panel points or supports at these intervals, is, for spans of—

Span.	Load.	Span.	Load.
5 feet,	14·00 tons.	11 feet,	25·60 tons.
6 "	16 00 "	12 "	27·00 "
7 "	18·60 "	13 "	28·30 "
8 "	20·50 "	14 "	29·50 "
9 "	22·10 "	15 "	30·00 "
10 "	23·80 "	16 "	31·20 "

DETAILS.

Since the method of connecting the several parts of a bridge has enabled Americans to compete successfully with foreign builders, it may be desirable to note some of the peculiarities of this system as exemplified in the structures of a few of the oldest companies.

During the transition period cast-iron joint-boxes were used quite freely, and still retain their place in combination bridges. Hollow cast-iron columns were used for compression, and long square links for the tension-members of the lower chords. These earlier forms are seen in the first bridges of Whipple and Fink (figs. 28, 38). The loops of square bar iron were subsequently modified by bending the ends of the rod around the pin and welding them down; and still later, to reduce the length of pin, they were made flat, with forged eyes upon their enlarged ends. For cast iron, as used in compression-members, various forms of rolled bars have been substituted, known as channels], "I," "T," angle L, cruciform +, deck ⊥, and other shapes.

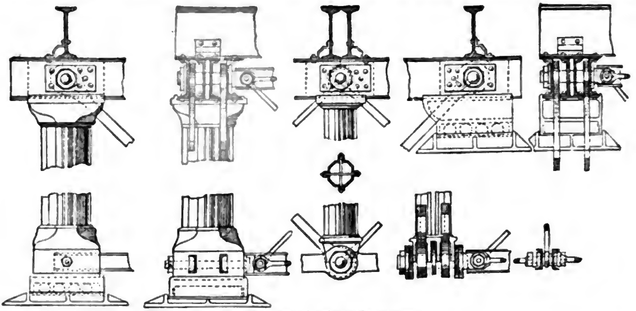


Fig. 67.—Keystone Deck Bridge—Details.

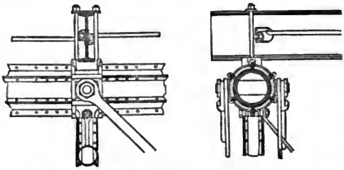


Fig. 68.—Details of Deck Bridge, top of Post with Cross-Girder *C*.

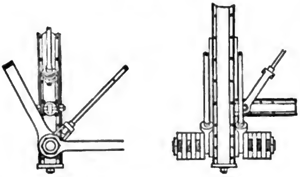

End. Side.

Fig. 69.—Deck Bridge Pin-Connections at foot of Post.

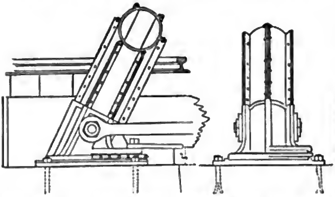


Fig. 70.—Details of Through Bridge, Shoe of End Strut.

The distinctive features of the columns manufactured by the Keystone, Phœnix, Kellogg, and other companies consist in the forms of their cross-sections and arrangement of their connections. The Phœnix Co. use a closely-riveted round column consisting of four or more segments united by rivets through the external longitudinal flanges (fig. 64), whilst the Keystone column is composed of angular sections united by bolts running dia-

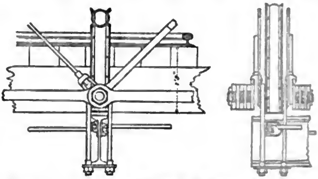


Fig. 71.—Details of a Through Bridge at foot of Post.

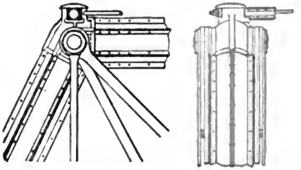


Fig. 72.—Connections, Phœnix Bridge Co.: Top Chord and Batter-Post.

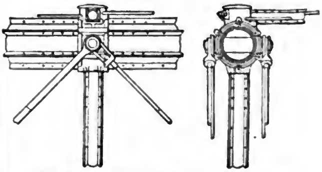


Fig. 73.—Panel-post, Chord, and Wind-brace.

metrically through, or by rivets passing through sleeves or separating pieces, leaving an open column. (See fig. 65.)

The arrangements for "deck" and "through" bridge connections are clearly shown in figs. 66, 67. Similar connections of the Phœnix Bridge Co. are shown in figs. 68, 69, 70, 71, 72, 73.

The Baltimore Bridge Co. uses for compression-members in Fink trusses a combination of an I-beam with the Phœnix quarter-section column. (See figs. 74, 75.) The joint-boxes for a Fink truss are shown in figs. 37, 38.

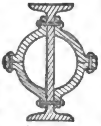


FIG. 74.

The "Kellogg" column is composed of concave or fluted longitudinal segments, with flanges on the edges. Various sizes are rolled, from 120° arc to 60°, making a column of from three to six such segments, with rivets under the flanges (figs. 76, 77). They are merely channel-bars bent to the proper angle. Another form consists of I-beams bent longitudinally at right angles and riveted back to back (*c*, *c*), (fig. 78).

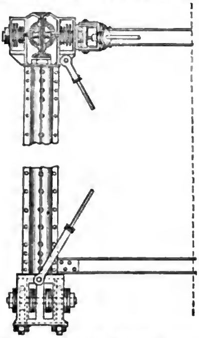


FIG. 75.—Section of Bridge as built by the Baltimore Bridge Co.

The American Bridge Co.'s column is composed of several "channels," with flat flanges united by a plate placed at right angles to the centre of their backs and connected by angle-irons, or an I-beam may be used instead, thus (*dd*) (fig. 63, 6, 8). Fig. 79 shows the connections at the foot and head of the American column when a rolled I-beam is used to support the roadway, as well as to serve the purpose of lateral bracing. When the upper chord is composed of three I-beams, the pin connections are made by a casting filling the space between the flanges, as shown in fig. 81.

In the stiffened triangular truss the compression-members are generally rectangular troughs, the sides of which are channels, the top, plates, and the bottoms lattice bars. Where the main struts are perforated by pins, as for the feet of sub-panel posts, they are reinforced by stiffening plates riveted on the webs. The connections for end-posts and laterals are shown in fig. 42, for panels and sub-panels of a deck-bridge in fig. 42, and the connections for road-bearers, ties, and lower chords in fig. 82. The same joints for a combination bridge pin-connection are shown in figs. —, —.

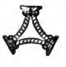


FIG. 76.

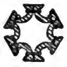


FIG. 77.

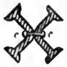


FIG. 78.

MOVABLE BRIDGES.

Movable or draw bridges are of very ancient date, and were used chiefly as bascules or portcullises to span the moats surrounding castles or fortresses. Subsequently, the necessity for keeping open navigable waters led to numerous modifications in the forms of this class of bridges, as well as to the methods of operating them. They may be composed of one or two arms, which may revolve about a horizontal or vertical axis, or they may slide in or out on a level, or revolve on a centre pin or pintle, thus forming the subdivisions known as *swing*, *lift*, *rolling*, or *pivot* bridges.

An early form of a lift bridge is shown in fig. 83 at *a*, where a portion of the floor is raised into an upright position by a windlass fastened to the fixed part of the span, in connection with a rope and pulleys as shown. This bridge was built on the post-route from Philadelphia to New York about 1810–14.

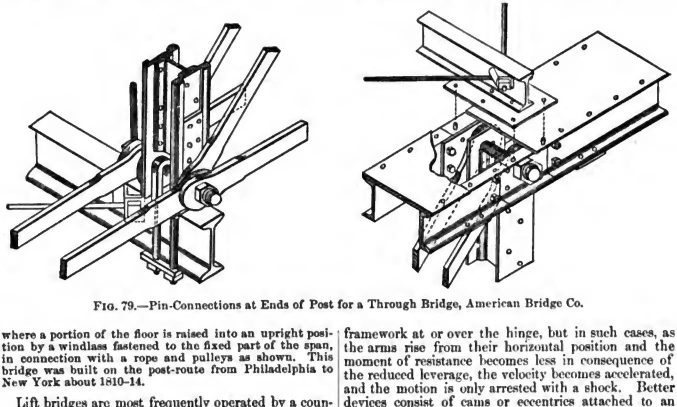


FIG. 79.—Pin-Connections at Ends of Post for a Through Bridge, American Bridge Co.

Lift bridges are most frequently operated by a counterpoise weight running over a pulley attached to a framework at or over the hinge, but in such cases, as the arms rise from their horizontal position and the moment of resistance becomes less in consequence of the reduced leverage, the velocity becomes accelerated, and the motion is only arrested with a shock. Better devices consist of cams or eccentrics attached to an arbor containing the lifting chains. The counterpoise chain passes over the eccentric, which is so adjusted that its longest radius is horizontal when the bridge is down, and its shortest when up. Other ingenious devices, as weights attached to a fixed point of support, etc., have been applied with equally good results. These bridges are only applicable for spans of limited extent, as for canal or ferry bridges and moats.

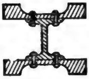


FIG. 80.

As the spans increase, *rolling* or *swing bridges* are resorted to for opening the channel. These are mounted upon rollers, either cylindrical for the former or conical for the latter case. When conical, the vertex of the cone if produced should be the centre of revolution, and the slant height equal to the radius. The cones are usually so short as to resemble and serve as wheels, supported in a pair of rings and rolling upon an annular track. The bridge is moved by a pinion —which gears into a rack on the ring—operated by a key or capstan turned by men, or in heavy long spans by a small engine. The safety of the bridge is secured by a lock and signal, which is connected with the centre of the draw and subject to the movements of the engineer or watchman.

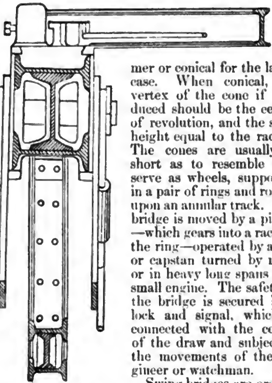


FIG. 81.—Detail, showing Post, Top Chord, and Wind-brace, built of I-beams.

Swing bridges are ordinarily subject to a reversal of the strains, due to their becoming ordinary trusses when closed and semi-girders when open, requiring a large amount of counterbracing, but the Menomonee and Kinnikinnie drawbridges, erected by Mr. C. S. Smith, are typical of a class of frames so arranged as to admit of no reversion of strains in the several members, and so supported that the load bears uniformly on the live ring by reason of a rocker link (*a*, fig. 84) at the head of the middle post-frame, eliminating any ambiguity as to the strains.

The draw at Sabula, 370 feet span, is probably the most complete in all its appointments. The ends are raised or lowered in forty-five seconds, and the draw swung open 90° in sixty-five seconds.

The Passaic drawbridge (fig. 85) is a wrought-iron double-track structure crossing the Passaic River at Newark, N. J., on the Morris and Essex Railroad. There are three trusses sustaining the tracks upon iron beams suspended from the lower chords. It is thus described in *Trans. Am. Soc. Civil Engineers* (1876):

"*General Dimensions.*—Length of trusses from centre to centre of end piers	220 ft. 6 in.
Height from centre to centre of chords	22 "
Width of bridge from centre to centre	30 "
Height of rail above water	45 "
Weights adopted for calculation:	
Dead load per lineal foot of bridge	2000 pounds.
Live load per lineal foot, covering both tracks throughout entire length	5000 "
Live load per lineal foot, covering both tracks for one-half the span	7000 "

"When the bridge is open, all the dead load is transmitted to the central support, and the strains are determined as in the case of a beam supported in the middle. When the bridge is shut and the wedges adjusted, the extremities are brought to rest only, and the strains due to dead load are not materially changed; the effects produced by the rolling loads are now determined under the assumption that the bridge is supported at the centre and extremities; and finally, the maximum strains are obtained by adding the strains due to fixed and rolling loads with their proper sign:

Weight of iron in trusses	350,770 lbs.
Weight of iron in turn-table	107,690 "
Total	458,460 lbs.

"The trusses are of the 'Whipple' type, with the end-posts inclined, and with two inclined posts and a vertical at the central point of support. The chords are, for the most part, made up of two 10-inch channels and a cover-plate on one side, with open lattice-work on the other, forming a trough shaped section. In the centre panels of the upper chord, where tension alone exists, eye-bars are used; all other connections in the chords are designed to resist both tension and compression. The lower chords of the centre truss abut against a casting which forms the upper portion of the turn-table, and are secured to it by angle-iron lugs. The lower chords and central posts of the outer trusses are riveted at their intersection to splice-plates, making a continuous wrought-iron connection. The connections at the abutment ends are also riveted. Vertical posts are made up of channels latticed on both sides, forming a rectangular section open on both sides to inspection. The ends are reinforced, and pin-holes bored for connection with the chords. No joint-boxes are used.

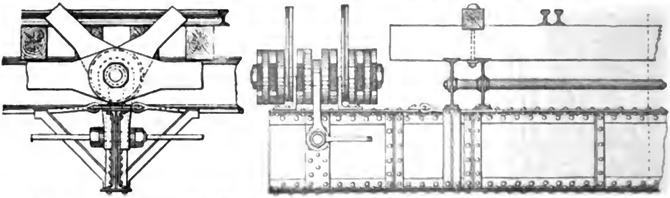


FIG. 82.—Details of Pin-Connection at Roadway-bearer of Stiffened Triangular Truss, Pennsylvania R. R.

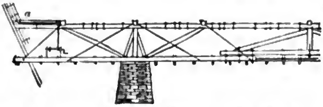


FIG. 83.—Drawbridge over Neshaminy Creek, near Philadelphia, Pa. (Built by Wernwag.)

"The dead weight of the bridge is transmitted to the revolving surface of the turn-table through the casting at the centre of the lower chord of the middle truss; that portion is borne by the middle truss directly, while the outer trusses rest upon the extremities of two plate-girders connected on each side the centre by diaphragm plates and lugs. By this means the entire weight of the outer trusses and cross-girders may be suspended upon twelve vertical bolts passing through holes in the sides of the central casting. This casting rests upon conical steel rollers enclosed between steel rings grooved to fit the coning of the rolls, and having half an inch play between: upon these rollers the bridge revolves. The lower ring is fitted to a cast-iron seat having a hemispherical cavity on the under side to receive a corresponding cast bearing-block which distributes the weight upon a wrought-iron pintle extending to the masonry. Under each end of the cross-girders are four trailing-wheels adjusted so as to bear lightly upon the track. When one line of rails is loaded, these wheels sustain a portion of the weight, but not when the bridge is turning. Attached to the lower side of the base-girders forming the ends of the bridge are castings containing movable wedges having 1½ inches vertical play; they are bevelled to fit bed-castings attached to piers, so that when they are driven to a bearing horizontal displacement becomes impossible. The free ends of the track are lifted simultaneously with the wedge-movement.

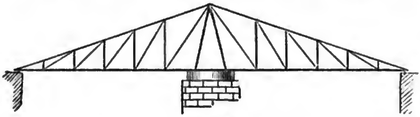


FIG. 84.

"The bridge may be operated either by steam or by hand, as desired. A double-cylinder engine drives a vertical shaft to which are attached two friction-clutches. By throwing the upper one into gear, a horizontal line of shafting is made to actuate the wedges and rail-lifters. By shifting to the lower friction, motion is communicated to a driving pinion working into cast toothed segments which are bolted to the masonry through the track. A vertical shaft for working by hand is placed between the rails; it communicates with the wedge gear by a chain-wheel and with the driving pinion by a small intermediate. The time required to withdraw the wedges and swing the bridge does not exceed two minutes. This structure was erected in place of an old wooden bridge during the winter of 1876-77, and the traffic of the railroad was not seriously interrupted during the progress of the work."

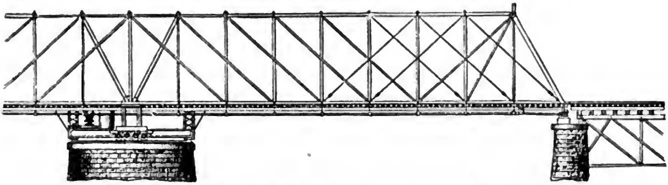


FIG. 85.—Passaic Drawbridge, Delaware, Lackawanna, and Western R. R.

One of the simplest forms of a *floating drawbridge* has long been in use at Rouse's Point, N. Y., where the Central Vermont Railroad crosses an arm of Lake Champlain.

It consisted of a large bateau or scow 300 feet long, 30 wide, and 7 deep, floored over with an arched deck, and containing two rows of posts in the hold under the stringers which carried the rails. The sides were stiffened by Pratt trusses of seven panels, each 10 feet high. The diagonal ties were rods of 1¼ inches diameter, which frequently broke from the twisting of the float by the waves. This floating span was operated by an engine placed on one side of the centre, which at first moved it in and out in the direction of the length of the bridge by chains fastened to an anchorage, but as it was found difficult to keep it in line in high winds, it was subsequently changed to swing around. The engine was taken from an old locomotive, and the whole was worked by one man, who opened or closed the draw in from two and a half to three minutes in fair weather and in five minutes in storms. When empty the scow drew about 12 inches of water, and with a train 300 feet long about 4 inches more. This draw formed but a small part of the centre of the bridge, which was 5000 feet long. It was built about 1850 by Henry R. Campbell, engineer, at a cost, exclusive of the draw, of about $300,000. The railway was single track. The permanent portion of the bridge is believed to have been an ordinary pile structure.

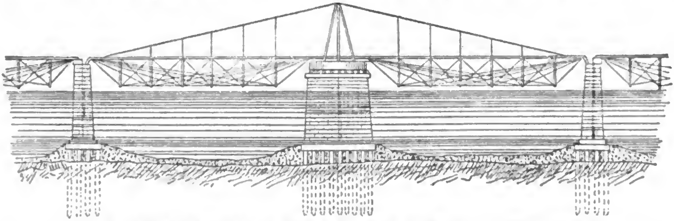


FIG. 86.—Railroad Drawbridge over the Mississippi River, at Quincy, Ill. (Bollman System.)

An adaptation of the Bollman truss to *pivot bridges* is shown in fig. 86, representing a portion of the celebrated bridge over the Mississippi at Quincy, Ill., erected in 1867–68. This draw-span is 190 feet long, having two bays of 95 feet each. The main portion of the bridge is composed of quadrangular girders of the Whipple type in spans of 200 and 157 feet. Its total length is 3189 feet, and of the bay branch 552 feet; total, 3741. Cost, $1,500,000. The pivot span in the main branch is 360 feet long, 26 feet high at ends, and 34 feet at centre. The clear width is 14 feet.

The pivot span of the Rock Island drawbridge over the Mississippi River is 368 feet long, and weighs 1,560,000 pounds above the rollers. The travelling weight on each wheel is 44,250 pounds. The span is rotated by two hydraulic rams worked by a double-cylinder engine. This bridge-span is peculiar in that it is proportioned without dead-weight reactions under the end-supports, that the top chord is composed entirely of eye-bars, that every panel-point in both chords is hinged vertically, and that all lateral connections are hinged horizontally. It carries two roadways. C. Shaler Smith was the engineer.

The longest draw-span in existence is that over the Raritan River, N. J., which has a total length of 472 feet. The section of the pintle and end elevation of the bridge is shown in fig. 87. This bridge was erected by the Keystone Co.

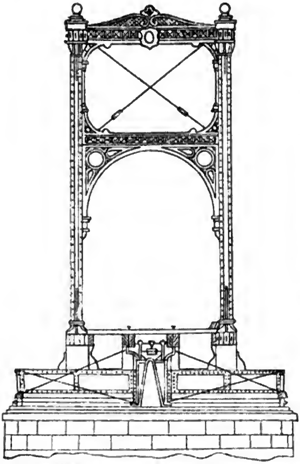


FIG. 87.—End Elevation and Section of Centre Pintle of Pivot Bridge over the Raritan River, N. J.

So great have the requirements of commerce become that in the construction of proposed structures over frequented waterways the draw-spans are now required to be 500 feet.

The table below, compiled by Messrs. T. C. Clarke and Thomas Griffin of the Phœnixville Bridge Works, gives the necessary data for determining the linear units of live load for all bridges.

Suspension Bridges.—Aside from the purely temporary pendent bridges of ropes, thongs, or fibres, the earliest designs of suspension bridges making any pretensions to permanency in America were those erected by James Finley of Fayette co., Pa., who patented his improvements in 1808, although he built bridges as early as 1797. The cable in these structures was composed of 7-feet links of square bar iron. The level roadway was attached to this by iron pendants of different lengths. The versed sine of the arc was a full one-seventh of the span, and the chain made equal angles with the vertical line through the tops of the piers, which were generally of wood. The first bridge of this description, of 70 feet span, 12½ feet width, warranted for fifty years (except the woodwork), was built over Jacob's Creek at a cost of $600. In 1810 there were eight of these bridges in existence, the largest of which was at the Falls of Schuylkill, Philadelphia, 306 feet span, aided by an intermediate pier. The first bridges were destitute of a parapet, but this want was soon supplied, and added much to the stiffness, as well as safety, of the bridge. The form in use until 1841–42, when Charles Ellett, Jr., substituted wire cables for chains, is clearly shown in fig. 88.

The first bridge of wire, which was erected at Fairmount, Philadelphia, in 1842, had a span of 358 feet, supported upon four obelisks by ten cables of 3 inches diameter. It served its purpose admirably for about thirty years, when it was removed to make room for a more commodious structure.

The beautiful wire suspension bridge at the crossing of the National Road over the Ohio River at Wheeling, Va., was also built by Ellett, in 1848–49. It was destroyed by a hurricane in 1854, which, being deflected

Actual Weights of Engines, Tenders, Cars, etc.

No.	Description.	Driving wheels.	Truck wheels.	Concentrated weight on drivers.	Driving-wheel base.		Resulting weight per foot.	Weight of engine and loaded tender.	Distance covered on track.		Resulting weight per foot.
	Class No. 1—"Pushers:"				Ft.	In.			Ft.	In.	
1	Reading Railway Tank, all	12	None	102,000	19	7	5204	102,000	36	0	2833
2	Reading Railway Tank, with tender	10	"	82,200	15	8	5268	132,200	54	1	2444
3	Pennsylvania Railway, with tender	8	"	80,000	22	0	3636	140,000	54	0	2593
4	Baltimore and Ohio Railway, with tender	8	2	84,000	12	6	6720	128,000	53	0	2415
5	Fairlie double-ender	12	None	60,480	8	0	7560	120,900	52	0	2325
	Class No. 2—Heavy coal and freight:										
6	Chicago, Burlington, and Quincy, freight	6	4	72,000	12	0	6000	128,000	53	6	2392
7	Reading, standard coal	6	4	53,000	9	6	5578	122,128	50	8	2410
8	Pennsylvania, standard freight	6	4	54,500	12	5	4360	129,900	54	0	2405
9	Delaware, Lackawanna, and Western, standard freight	6	4	71,500	12	0	5948	138,900	54	0	2572
10	New York Central, special freight	6	2	65,000	15	6	4193	120,000	45	0	2666
11	Erie broad-gauge, special freight	6	4	72,156	14	6	4976	137,444	54	0	2545
	Class No. 3—Mixed passenger and freight:										
12	Reading, mixed passenger and freight	4	4	41,440	6	6	6376	115,184	45	7	2526
13	Reading, standard passenger	4	4	25,264	6	6	3887	103,260	43	10	2325
14	Pennsylvania, standard passenger	4	4	45,400	8	0	5675	125,300	53	6	2342
15	Grand Trunk of Canada, standard passenger and freight	4	4	40,320	7	6	5376	112,000	49	0	2275
16	New York Central, standard passenger and freight	4	4	40,000	7	6	5460	100,000	44	0	2272
17	Average of loaded tenders	...	8	16,500 25,000	4	6	3666 5550	33,000 50,000	20	0	1650 2500
	Class No. 4—Loaded cars:										
18	Pennsylvania Railway, sleeping and passenger cars	...	..	....	...	...	......	57,000	64	2	888
19	Pennsylvania Railway, box freight-cars	...	..	....	...	...	......	42,000	31	0	1355
20	Reading, long coal-cars	...	..	....	...	...	......	40,000	22	0	1818
21	Lehigh Valley, short coal-cars	...	..	....	...	...	......	19,000	13	0	1461
22	Pullman palace and sleeping cars	...	..	....	...	...	......	71,600	75	0	955

From this it appears that the greatest strain per lineal foot of driving-wheel base would be produced by No. 5, an English pattern seldom used in this country, which amounts to 7560 pounds on both rails, or 3780 pounds—say 1⅞ tons—on each truss per foot.

from the water-surface below, raised the centre of the bridge 20 feet. The span was 1010 feet, or 960 feet clear, being the longest single-span bridge then in existence. The twelve cables contained 6600 wires, having a net section of 93 square inches, and weighing 313 pounds per foot of span. The total weight between the towers was but 440 tons. The deflection was $\frac{1}{13}$ the span; width of roadway, 24 feet in the clear; and height above low water 93½ feet at centre of bridge, with a grade of 4 feet per 100 towards the ends. After its destruction it was immediately replaced by a similar structure, which was completed in November of the same year (1854). The cost of the original bridge was $161,594, and of its successor only $37,000. It was again rebuilt in 1860, at a cost of $55,000.

Major Ellett also proposed a railroad suspension bridge for the Niagara River crossing, and actually constructed a preliminary foot-bridge over the gorge: but in consequence of some litigation operations were suspended. The Clifton bridge at Niagara Falls, intended for foot-passengers only, has a span of 1268 feet 4 inches between towers. The deflection varies from 89 feet in winter to 92 in summer. The Niagara Suspension Bridge was completed under Mr. John A. Roebling in 1852–55. For a description of this, the only bridge of its kind, see § 80 and Plate XIX. in article on BRIDGES in ENCYCLOPÆDIA BRITANNICA. The boldness of the design can more readily be seen by reference to fig. 89.

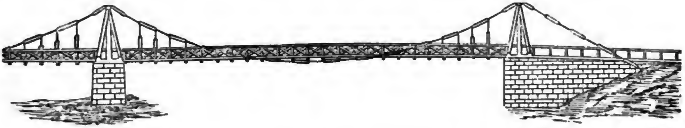


FIG. 88.—Finley's Chain Bridge.

Mr. Roebling built the long span between Cincinnati and Covington, of which the main bay measures 1057 feet between towers, and the end bays 281 feet each; total length, 1619; deflection of cables, 89 feet; factor of safety, $\frac{1}{6}$; elevation of floor at centre above low water, 103 feet, and at tower 91 feet. The total length, including approaches, is 2252 feet. There are only two cables, 12¼ inches in diameter, each of which contains 5200 No. 9 wires; ultimate strength of each, 4212 tons; weight of main span, 1500 tons. This bridge was completed in 1867.

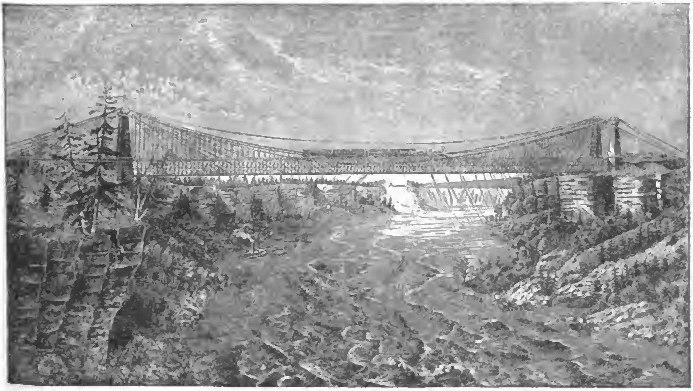


FIG. 89.

Even this magnificent span has since been excelled in the Brooklyn Bridge (fig. 90), connecting that city with New York by a single reach of 1595 feet. The approach on the New York side is 2492½ feet long, and that on the Brooklyn side 1901 feet, making the total length 5989 feet. The height of the bridge at the centre above high water is 135 feet, and at the ends 120 feet. The width is 85 feet. There are four cables, each 15¾ inches in diameter, containing 5434 parallel wires. The cables each have an ultimate strength of 11,200 tons. The piers are 1620 feet apart between centres, 280 feet high and 134 feet long, by 56 wide at the water-line. They are perforated by two pointed arches at the height of the floor, forming entrances to the main span. Each arch, 32 feet wide, admits a railroad-track, carriage- and footway. The piers each contain over 900,000 cubic feet of granite, weighing over 70,000 tons. The weight of the bridge will be 3600 tons, and that of the maximum load, when covered with people, cars, and vehicles, 1400 tons, making the total load about 5000 tons. To stiffen it against wind-pressure, the outer cables are inclined inward at the centre of the span, whilst the inner cables are drawn in at the piers and spread at the centre, neither hanging in a vertical plane, thus bracing the structure laterally. The grade of the approaches, which are built of heavy masonry arcades, is 3½ feet in a hundred. The deflection of the cables is 130 feet, and their working strain is but $\frac{1}{10}$ of their ultimate strength. This grand structure was designed by the same eminent wire-bridge builder, John A. Roebling, who lost his life by an accident during the sinking of the caissons. He was succeeded as consulting engineer by his son, Col. William A. Roebling, under whose careful supervision the work is now (1883) completed.

Ground was broken for the Brooklyn pier Jan. 3, 1870. The estimated cost was $10,000,000; the actual cost was $15,500,000. The engineering difficulties overcome in the prosecution of this great undertaking are too numerous to be mentioned here.

We have thus instanced the rapid development of this branch of bridge-building in the United States. Aside from the special structures mentioned are many others worthy of notice, among which are the suspension canal aqueduct at Pittsburg, which was also built by Mr. Roebling, in 1845. It consisted of seven spans of 160 feet each. Deflection, 14½ feet = about $\frac{1}{11}$ the span. There were but two cables, each 7 inches in diameter. Total strength of both cables, 1866 tons.

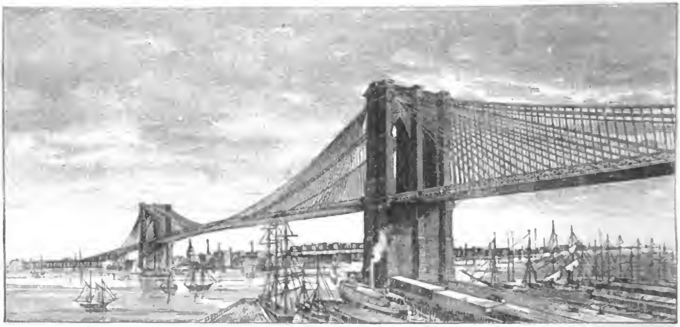


Fig. 90.—East River Suspension Bridge.

The "Point Bridge," also at Pittsburg, is peculiar in that the chain is stiffened by a truss, as shown in fig. 91, hinged at the centre and piers. This bridge, designed by Mr. Edward Hemberlé, engineer of the American Bridge Company, crosses the Monongahela in three spans, the longest being 800 feet in length between the piers. The end trusses are only 145 feet each. The towers are 180 feet above water-level, and the deflection of the chains is 88 feet. The roadway is 20 feet wide, containing a street-car track and two carriage-ways; outside are two footwalks, each 6 feet wide. The entire load is carried by the chain, which is merely stiffened by the truss attached thereto. This is the first instance of a trussed suspension cable on record, and reflects great credit upon its designer.

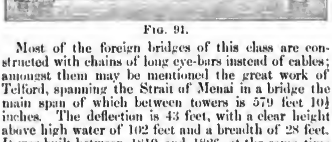


Fig. 91.

Most of the foreign bridges of this class are constructed with chains of long eye-bars instead of cables; amongst them may be mentioned the great work of Telford, spanning the Strait of Menai in a bridge the main span of which between towers is 579 feet 10½ inches. The deflection is 43 feet, with a clear height above high water of 102 feet and a breadth of 28 feet. It was built between 1819 and 1826, at the same time with the Conway Bridge, also a suspension, having a span of but 327 feet.

The Brighton Chain Pier, consisting of four spans of 225 feet each, and having a total length of 1014 feet, built in 1823, was destroyed by a violent gale in Nov., 1836, from lack of sufficiently stiff side-railings.

The suspension bridge over the Esk, completed in 1829, had a span of 432 feet and a deflection of $\frac{1}{10}$ the span. It fell Oct. 11, 1838, by the twisting asunder of the vertical suspending rods, in consequence of their having no joints at their junction with the road-bearers.

The celebrated bridge over the Sarine at Freiburg, in Switzerland, was built by M. Chaley in 1834. It has a span of 870 feet 9 inches and a height above water of 167 feet. Deflection, 63 feet. In this case the cables, four in number and 5½ inches in diameter, are made up of iron wire, each containing 1056 wires, one-eighth of an inch in diameter. The anchorages and all the questions of detail were resolved by its engineer in a masterly manner, and the structure is justly regarded as the best and largest type of suspension bridges in Europe.

The "rigid" suspension bridge proposed by the English engineer Mr. Leather, consisting of an arched rib from which depended the roadway, was clearly anticipated by its American prototype erected at Trenton by Wernwag in 1804, as shown in fig. 10. An iron bridge of this description, with a span of 108 feet, was subsequently built over the Aire at Leeds, known as the Monk Bridge.

MILITARY BRIDGES.

The exigencies of the military service are such as to require numerous special appliances for the passage of rivers by both advancing and retiring forces. Hence the means provided must be such as may be rapidly constructed or destroyed, or both. These requirements are ordinarily fulfilled by the use of portable bridges, the basis of which consists of floats made of wooden boats or pontoons. This form has descended from the Romans. Mention is made by M. Couplet of a bridge 200 feet long, easily taken apart and put together again, which forty men could carry.

The French pontoon, formerly of copper, is now made of wood. It is 31 feet long, about 5 feet 7 inches wide at middle, and 2 feet 7 inches deep. Each boat weighs 1455 pounds, requiring from sixteen to twenty men to carry it, and a train of seventy-seven six-horse wagons to convey a bridge 790 feet in length. The displacement of a single float is about 19,000 pounds. The Austrians use a flat-bottomed wooden float in connection with a trestle named after its inventor, Colonel Birago. The Russians use canvas floats composed of wooden frames, over which an impermeable canvas cover is stretched and tied to the upper rails. These floats weigh but 718 pounds, and have a displacement equivalent to 13,428 pounds.

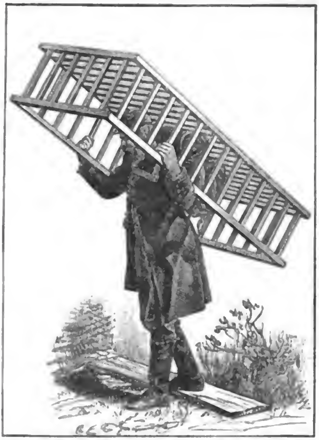


FIG. 92.—Department of U. S. Military Railroads: Blanket Boat-frame.

In the United States no provision was made for the systematic passage of rivers until Congress passed an act, May 15, 1846, authorizing the formation of a bridge-equipment corps to accompany the army, then operating in Mexico, but it was too late to be of any service in that campaign. During the late Civil War various forms were experimented with, including all of those above mentioned and numerous others devised by the chief of the Bureau of United States Military Railroads, some of which were so simple and effective as to merit a brief description.

The object being to dispense with the cumbersome pontoon-trains requiring thirty-five six-horse carriages for a 600-foot bridge, efforts were made to provide a substitute of a more portable nature, capable of being carried by the troops or of being readily assembled from the materials ordinarily available. To this end the soldier's rubber blanket, 6×4¾ feet, always on hand, was made the basis of a system of "blanket boats," one of which could carry two men. These being lashed together into floats or bateaux were found to answer for the transportation of artillery or for the support of the ordinary timber *balks* and *chesses* composing the roadway of the regular rubber pontoon.

The unit of this system, which was designed by Gen. H. Haupt, chief of the bureau, consists of a rectangular crib (fig. 92) 4 feet long, 2¾ wide, and 1 deep, made of round sticks 1 to 1½ inches in diameter, the ends of which are cut down and driven into holes bored in the rails at top and bottom. Over this framework the army blanket is folded and tied by cords passing through the eyelets. The area of the bottom of one boat being 11 square feet, it would require 687 pounds to sink it 1 foot, and an average man would displace less than 4 inches. The only tools required to construct such a float are a pocket (¼-inch) auger, a large knife or hatchet, and a billet of wood for a mallet. The weight of a frame constructed of split green oak sticks of large size is 65 pounds, and of the blanket from 7 to 10 pounds. After getting out the material it was found that a corps of forty men, (see fig. 93), working in pairs, could put together twenty cribs in from 8 to 16 minutes, and that it required from 5 to 8 minutes more to tie on the blankets.

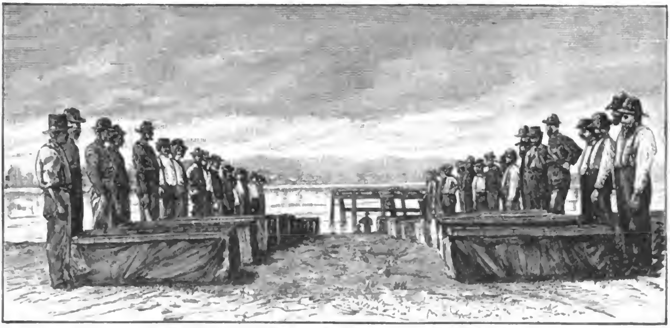


FIG. 93.—Drill of "Blanket Boat" Corps, U. S. Military Railroad.

A sufficient number of such floats, lashed together, were made to serve as rafts for infantry, cavalry (by swimming the horses), or even for artillery, as seen in the accompanying fig. 94, showing eight artillery-men, twenty infantry, and a piece of artillery resting on railroad ties, the weight of which was equivalent to thirty-three men, making in all a load, besides the gun and carriage, of say sixty men. The raft consisted of thirty boats arranged as shown. A well-organized company could therefore be prepared to cross a stream within half an hour after arrival at its banks if provided with the material.

Various other forms of bridges for passing rivers were proposed and used, consisting of trestles, trusses, and suspension-bridges, too numerous in their modifications to be noticed in this place. It was customary to keep a stock of bridge-members or of trusses on hand, so that in case of the destruction of a bridge they could be sent

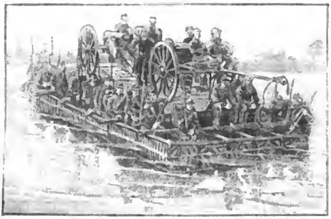


FIG. 94.—Bateau of Blanket Boats, U. S. Military R. R.

out by special train and be immediately put in position. In some cases in Virginia twenty-four hours after the destruction of a bridge by the enemy trains were running over its successor.

Flying bridges, being nothing more nor less than ferries, will be described under that head.

REFERENCES.

For further information on this subject the following works may be consulted: Pope on *Bridge Architecture* (1811); Whipple on *Bridges*; Haupt on *Bridge Construction*; Shreve, *Bridges and Roofs*; Trautwine's *Engineer's Pocket-book*; *The Towne Truss*; Knight's *Am. Mech. Dictionary*; Spon's *Dictionary of Engineering*; *Transactions Institution of Civil Engineers*; *Transactions American Society of Civil Engineers*; *Franklin Institute Journal*; M. Malézieux, *Travaux Publics des États-Unis d'Amérique* (1870); L. Ant. Comolli, *Les Ponts de l'Amérique du Nord* (1879); M. Chevallier, *Histoire, etc., des Voies de Communication aux États-Unis* (1843); Major Warren, U. S. E., *Bridging the Mississippi River*; *Reports of the Chief of Engineers, U. S. A.*; *American Engineer*; *Engineering News*; *Engineering*; *Report of the Cincinnati Southern* and other railroads; Bow's *Treatise on Bracing*; Bow's *Economics of Construction*; Burr's *Stresses in Bridge and Roof Trusses*; Greene's *Graphical Analysis of Bridge and Roof Trusses*; Du Bois, *Graphical Analysis*; *Report of International Exhibition of 1876*. (L. M. H.)

BRIDGETON, the county-seat of Cumberland co., N. J., is a port of entry, at the head of navigation on Cohansey River. It is 36 miles S. of Philadelphia, at the southern terminus of a branch of the West Jersey Railroad. The Jersey Southern Railroad also passes through it. It has a fine court-house, an opera-house, two hotels, a national bank, one daily and four weekly newspapers, ten churches, three boarding-schools, four public schools, and a library. It has two iron-foundries, a machine-shop, nail-works, woollen-mill, two flour-mills, and there are also four large glass-works. Its appearance is attractive; it is lighted with gas and has good water-works. Its public debt is $76,500, and its expenses for the year 1881 were $35,300. Population, generally of American origin, 8722.

BRIDGMAN, FREDERICK A., an American artist, was born in Alabama in 1847. He learned engraving, and was for about four years in the employ of the American Bank-note Company. During this time he studied in his leisure hours with a view of qualifying himself as a painter, and in 1866 he went to Paris, where he entered the École des Beaux-Arts. His master was Gérôme, and his style was much influenced by that artist. While at the École des Beaux-Arts, Bridgman made several trips to Brittany for sketching purposes, and subsequently he extended his travels to the Pyrenees, Algiers, and Egypt. Bridgman exhibited at the Paris Salon at an early date in his career, and he has been a frequent contributor to the prominent French and American exhibitions of late years. Among his notable works are Up Early, Girls in the Way, Apollo bearing off Cyrene, Bringing in the Corn, A Nubian Story-teller, The Flower of the Harem, Illusions of High Life, The American Circus in Paris, Tête-à-tête in Cairo, The Funeral of a Mummy, and A Roumelian Lady. The pictures of this artist are carefully studied and skilfully composed, but the most important of them recall the style of Gérôme and Gérôme's subjects too positively for them to be entitled to great commendation as independent expressions. He is, besides, lacking in that dramatic power which gives an interest to some of Gérôme's most labored and most unpleasant works. Bridgman, however, has from the first had two manners, and there is almost as much difference between the breadth and freedom of his Bringing Home the Corn—a reminiscence of Brittany—and the labored style of portions of The Funeral of a Mummy as if the two works were from different hands. The landscape in the last-named work, however, is painted in what would seem to be the artist's native style, for as he has gained in age and experience he has been getting farther and farther from the peculiar hardness of Gérôme, until in his Roumelian Lady there is scarcely a perceptible trace of the manner of that artist. For The Funeral of a Mummy, Bridgman was awarded a medal at the Salon of 1877, and the same picture won for him the decoration of the Legion of Honor at the Paris Exhibition of 1878. He was elected an Associate of the National Academy of Design in New York in 1875. (W. J. C., JR.)

BRIDGMAN, LAURA DEWEY, was born at Hanover, N. H., Dec. 21, 1829, and at birth showed no deficiency of bodily endowments. Three years later, after an acute attack of scarlet fever, she lost sight and hearing, and in a great degree also the senses of taste and of smell. Laura's helpless condition was a source of constant anxiety, while her natural vivacity of temperament sometimes prompted her to acts of mischief. Dr. S. G. Howe of Boston visited the home of Laura's parents, and, having seen the little girl, at once determined to do what he could for her education. She was brought to the blind asylum at South Boston Oct. 12, 1837. Dr. Howe had now before him a most difficult undertaking. Here was a human soul imprisoned in a body whose mutilated senses afforded no avenue for those impressions from without which form our ideas of the world. Intercourse with the minds of others was also denied her. Her doom seemed one of impenetrable darkness and of unbroken silence. History afforded no precedent by which any effort for her enlightenment could be guided. In Dr. Howe's account of this matter appears the admirable logic of his mode of procedure. In the task before him discipline and the necessity of obedience were the first points to be gained. The little girl was taught to sit quietly in her chair at stated times, and at others to perform some simple gymnastics intended to develop her muscles and improve her use of them. Dr. Howe caused labels in raised type to be pasted upon corresponding articles, such as a fork, a spoon, a chair, etc. The finger of the pupil was led to follow these letters, while at the same time she was encouraged to ascertain by feeling the shape and character of the objects themselves. It was now evident that she perceived the difference between one and another of the labels. The next step was to give them to her, and to encourage her to lay them upon the several articles which they were intended to indicate. This also she learned to do by one effort of memory, but still with no idea of the relation of the words to the things themselves. After a while, instead of labels, the letters composing the words were given to her in their proper order, so as to spell *book*, *key*, etc. Then the letters were handed to her unselected, and she was made to understand that she must so arrange them as to form the words to which her attention had previously been called.

Up to this point her action had been purely imitative and mechanical. But from this time her mental development began to be assured. A set of metallic types was devised, and after two months of instruction in spelling words with type she was taught the finger-alphabet used by the deaf and dumb. Her studies were greatly facilitated by its use, and her communication with the outer world was thenceforth carried on through this medium.

Having learned to read in raised letters, Laura was next taught to write, using, as the blind do, a sheet of pasteboard grooved for the purpose, upon which the paper is laid and the letters are written with a pencil. This process seemed at first incomprehensible to her, but on being made to understand that it would enable her to express and communicate her thoughts, she evinced great joy and set herself very earnestly to work to conquer the new difficulty. In a few months she was able to write the following letter to her mother:

> "Laura will write letter to mother. Laura will ride with father. Laura will make purse for mother. Mother will kiss and love Laura. Laura will go home."

The order of her instruction in the use of language was the following: Nouns first, and in particular the names of all familiar objects. Verbs next, and of them the active first, illustrated by the action, as: *shut door, open door*. Adjectives came next, and were easily learned, while nouns of quality, such as sweetness, hardness, etc., could not be comprehended until a later period. Prepositions followed, taught by tangible illustration: "Ring on box—ring in box." "In this case," says Dr. Howe's report, "the perception seemed instantaneous, and the natural sign by which she expressed it was peculiar and striking. She spelt *o-n*, then laid one hand *on* the other; then she spelt *i-n*, and enclosed one hand *within* the other." Her use of verbs was not, at first, distinguished by the differences of time. She asked for what she wished in the most direct way: "Bread give Laura—water drink Laura."

While Dr. Howe closely supervised Laura's elementary education, he was obliged, on account of his duties as principal of the institution for the blind, to entrust much of her later tuition to trained teachers. Two of these instructors kept each a diary in which Laura's progress was carefully noted. Much time was necessarily expended in explaining to her the most familiar facts in the world by which she was surrounded. From the observation of material things she was led to those especially human processes in which thought itself becomes the object of thought. The task of instructing her was quickened in interest by the quaintness of her attitude towards external things. "In studying the history of Greece she is surprised to learn of so much fighting, and asks, 'Did the Thebans and Spartans and Persians know about our Father? I do not think they did, for they would not fight so much.' At a later date she observes the adornments in her teacher's house, and says, 'I am more fond of beauties than of anything else in the world.' The teacher suggests goodness, and Laura says, 'I meant goodness was the greatest beauty of all.'"

Laura's tendency to outward expression showed itself both in her rapidly-gained command of language and in the volubility with which she made her thoughts and wishes known through her finger-alphabet. Her love of conversation was such that, while feeding herself with one hand, she would spell her words with the other. She has even been seen to talk with her fingers in her sleep. She had also learned to express herself fluently in writing, and showed a love for long words and pleonastic expressions. Besides the facts and methods learned from books, she had acquired a surprising knowledge of the world about her. She was fastidious in her friendships, and judged of people a good deal as she felt either their refinement or their want of it. Her behavior was throughout careful and modest, and her greatest infirmity lay in an excitable temper, which was no doubt aggravated by her pent-up condition, which study and exercise failed to relieve entirely. "Wrong, wrong," she would say when she had offended, and her quick sense of this would certainly vindicate the inherence of conscience in the human soul.

Besides those noises which were intended to express displeasure, she had found or invented a separate sound for each of her friends, and would use this on meeting them. She also made efforts from time to time to acquire the power of articulate speech, and was taught to say "doctor," "baby," "apple," and some other words. She early showed a taste for personal adornment, and was anxious that her dress should be in good taste. Having no perception of color, she yet understood its significance, and would often ask whether her gown, her ribbon, etc., were of a good shade.

The keenness of Laura's sense of touch was surprising even to those most familiar with the intensification which the loss of one sense usually develops in those that remain. The slightest contact with her hand early enabled her to recognize persons who had been long absent from her neighborhood. She sometimes detected the relationship of sisters by touch alone. She knew the doctor's step by its vibration through the floor, and could tell through the same medium whether one or several persons were in the room with her.

Her disposition was always extremely social, and while this fact must have aggravated her suffering in the privation of ordinary intercourse, it had the advantage of heightening her enjoyment of such opportunities of communication with others as were afforded her. She must have learned early in life that she was an object of interest to many people. For many years her presence at the institution at South Boston has attracted to it numerous visitors, among whom have been European travellers. The intensity of interest at first awakened by her case has to some extent declined, and she has been obliged in later years to rely much upon her own resources for occupation and amusement.

Laura has more than once enjoyed the pleasure of teaching, as well as that of being taught. While still a novice in the use of language she gave some aid to a young girl similarly afflicted with herself, who remained under tuition at the institution for a few months. A little later, Oliver Caswell, a boy suffering also from the privation of sight and hearing, became a pupil at the same place, and was assisted by Laura in acquiring the use of the finger-alphabet. Having become an expert in arithmetic, she was allowed to teach it to a little girl who was entirely deaf and nearly blind. In her diary she speaks of this, and expresses surprise and pleasure at her own success.

In matters of religion Dr. Howe's great anxiety was that the development of her spiritual faculties should be in accordance with the normal conditions of thought and faith—conditions which, in his view, were often violated by popular methods of religious instruction. In one of his reports he relates that he availed himself of the occasion of the death of a fellow-pupil to lead Laura to recognize the difference between life and death, and to infer from the aspect of the latter the existence of a vital power which might survive the dissolution of the body.

Laura easily acquired habits of order and of neatness. She seems either to have been industrious by nature or to have become so at an early period in her education. In her youth she was a proficient in fancy knitting, and could not only sew neatly, but was able to thread her needle with her tongue.

Laura's bodily health, in the long period during which it has been under observation, has been reasonably good except in the years 1845 and 1846, when for a time her strength appeared to desert her, and she grew pale, ill, and melancholy. Great anxiety was felt for her, but her good constitution, aided by judicious and careful treatment, triumphed in the end, and she recovered both her health and her natural cheerfulness. Before this period her sense of smell had much improved, and with it that of taste. Being of a highly nervous and sensitive organization, she is easily excited or depressed, and is very apt to complain of various aches and ills, while she rarely suffers any serious disorder.

Laura Bridgman is now (1883) fifty-three years of age. Her figure is slight and her appearance somewhat old for her years, but her temperament is as vivacious as ever. She has a permanent home provided for her in one of the houses belonging to the South Boston institution for the blind. She is fond of earning money, which she does by various small industries. She contributed a handkerchief border of knitted lace to the exhibit made by the institution at the Centennial Exhibition in 1876. She has now learned to run the sewing-machine, and by means of it assists in the domestic work of the institution.

The number of books printed in raised type for the use of the blind has been greatly increased of late, and Laura in her solitary hours profits much by those to which she has access. Her sense of humor is always keen, and she enjoys fun and pleasantry as she always has done, though the passage of time has brought to her the sorrows which it brings to others. The most severe among them have been the loss of her father and the death of her more than father, Dr. Howe. She was allowed to come to his bedside shortly before he breathed his last. The touching expression of her grief on this occasion, and on that of his funeral, will never be forgotten by those who saw it.

A reference to Laura's diary and to those of her teachers will show that religious ideas have always greatly interested her. Dr. Howe's efforts to shield her from the well-meant interference of sectarian zealots in no sense kept from her the truths of the Christian religion, in which she is an earnest believer. She is a member of a Baptist church, which she attends regularly, and is glad to speak of the comfort she derives from participation in the ordinances of religion.

(J. W. H.)

BRIGHT, JOHN, an English statesman and orator, was born at Greenbank, near Rochdale, in Lancashire, Nov. 16, 1811. His family are descended from Abraham Bright, who in 1714 came from Wiltshire and settled at Foleshill in Warwickshire. Jacob Bright, great-grandson of Abraham, having learned the trade of a hand-loom weaver, went in 1802 to the neighborhood of Rochdale, and became interested somewhat later in one of the earliest of the cotton-spinning factories of that region, presently laying the foundation of what has become in the hands of his sons a very extensive and successful business. The family have been for several generations members of the Society of Friends, or "Quakers," and the characteristics of John Bright, with many of his views on public questions, may readily be traced to the influence of that religious body and its usages. He was in part educated at Ackworth, a well-known Friends' school, but went subsequently to a school at York, and later, for a year and a half, to another at Newton. In February, 1827, when he was a little more than fifteen years old, he joined his father in the factory, and entered upon what was designed to be a life of business. But he early showed an active interest in public affairs; in 1830 his enthusiasm was stirred by an election contest during the movement for parliamentary reform. In the same year he began to speak at temperance meetings in country places near Rochdale, and his ability as an orator manifested itself. His earlier speeches were written out and committed to memory; but finding this method a restraint on free utterance, he adopted the plan of preparing an outline of his intended address and writing out only the more important parts. The formation of the Rochdale Literary and Philosophical Society in 1833 gave him an excellent opportunity for improving his oratorical talents, although religious and political subjects were excluded from debate. He made his first visit to the Continent in that year, and two years later he spent eight months in travelling through the East, visiting Greece, Egypt, and Palestine. His observations during these travels formed the subject of some lectures before the Rochdale society. When the question of national education enlisted public attention in England in 1835, Mr. Bright took a warm interest in the movement in behalf of the working class, and was thus first brought in contact with Richard Cobden of Manchester. The two were men of similar origin—sprung from the people—with similar training and similar views of social questions. It is not surprising, therefore, that their acquaintance ripened into a close intimacy when the great social movement of the day drew out their energies and raised them to be leaders of public opinion. At first their labors were directed only to the improvement and extension of primary education. Neither was an original member of the Anti-Corn-Law Association, which was formed at Manchester in 1838, but when this was changed, at Mr. Cobden's suggestion, into the National Anti-Corn-Law League, Mr. Bright's name stood second on the list of the provisional committee, and he and his father contributed freely to its fund. Yet Mr. Bright was still simply a manufacturer, attending to the daily round of business, though thinking deeply on matters which concerned the welfare of the people. In November, 1839, he married Elizabeth Priestman, the eldest daughter of Mr. Jonathan Priestman of Newcastle-upon-Tyne. A few months later he had an opportunity of showing that personal respect for Her Majesty Queen Victoria which has been a somewhat notable characteristic in one who holds all men equal in the sight of their Creator, and is at odds with the creation and maintenance of privileged classes in society. At a meeting called at Rochdale to adopt a congratulatory address to the queen respecting her marriage, he opposed the nomination of the rector to preside, on the ground that he had on a previous occasion taken part in proceedings derogatory to Her Majesty. Later in the year Mr. Bright headed the opposition to a local levy of church rates, and with considerable difficulty secured their practical abolition in Rochdale. The judgment and common sense which gave him victory in these matters, as well as his oratorical powers, showed him to be well qualified for the higher position he was soon called to fill.

In 1841 he suffered a heavy blow in the death of his wife. On the very day after that event Mr. Cobden came to rouse him to fresh labor, and besought him now to devote his energies to the movement for the corn-law repeal. Bright yielded, and entered on that memorable struggle in which the two fought side by side in the full view of the world, Cobden devoting himself to logical argument and array of facts to convince the rulers of England of the necessity and justice of free trade in grain, while Bright overwhelmed opposition with the torrent of his enthusiasm. The bent of his mind and training appeared in his uniform treatment of the problem on moral rather than political grounds, so that he was able to appeal to men of all parties and all classes to join in relieving the destitution of the people. In the midst of the contest, in 1843, he was nominated for a seat in Parliament as representative of Durham, and, though he was defeated at first, his successful opponent was soon unseated for bribery, and at the second contest Mr. Bright was elected. On Aug. 7, 1843, he delivered his first speech in Parliament in support of a motion referring to the customs revenue. Throughout the country the agitation in favor of corn-law repeal continued, tracts and pamphlets were everywhere circulated, enormous meetings were held in all the cities and towns and often in country places; many of those who had heretofore been unable to vote for want of the property qualification were assisted in obtaining the right of suffrage. In all these labors Mr. Bright took an active part, assiduously seconding the efforts of Cobden, and the ultimate success of the movement in winning over Sir Robert Peel and securing the abolition of the corn laws was largely due to him.

Scarcely had the commotion attending the corn-law agitation subsided when a similar movement was started in behalf of the operatives in factories, proposing to fix the legal limit of their daily work at ten hours. This Mr. Bright did not hesitate to oppose, maintaining that the workmen and their employers should be left entirely free to regulate their mutual relations; but even his own work-people, with whom he has always maintained the kindest relations, forwarded a petition in favor of the bill, and in June, 1847, it became a law. In the next month he was elected as one of the members of Parliament for Manchester, though his opposition to the Ten-Hour Bill had for the time diminished his popularity. The most important subject which then engaged his attention was the condition of Ireland, and as a partial remedy for the ills of that unhappy country Mr. Bright proposed the application of the principles of free trade to land. He also urged upon the Government the expediency of examining the resources of India and of securing from that country a supply of cotton. Though the Government took no steps in this matter, the Manchester Chamber of Commerce began an investigation in November, 1850, the initial of further recent efforts in the same direction.

In June, 1849, Mr. Bright married as his second wife Miss Margaret E. Leatham, daughter of a banker of Wakefield. The issue of this marriage has been four sons and three daughters, but one of the sons died in childhood.

Mr. Bright shared with Mr. Cobden that abhorrence of war which led the latter in 1849 to propose international arbitration as a substitute, and took part in the peace congresses which were held about that time. He also opposed the public demand for increased armaments which followed the seizure of imperial power by Louis Napoleon. A little later, when England, during Lord Aberdeen's ministry, drifted into war with Russia, from first to last Mr. Bright resisted the course of the Government, and maintained his ground in the face of the strongest opposition in Parliament, among his own constituents, and in the country at large. One of his most memorable speeches was delivered on Feb. 23, 1855, when he deprecated the further prosecution of the war. In a most impressive passage he referred to the slaying of the first-born in Egypt, and spoke of the angel of death as abroad throughout England, "taking his victims from the castle of the noble, the mansion of the wealthy, and the cottage of the poor and lowly," and in behalf of all these classes made his solemn appeal. It was, however, in vain. He had long continued at his post, though suffering from ill-health brought on by overwork, but in November, 1856, he was compelled to retire from Parliament, and offered his resignation to the Liberal electors of Manchester. In the following March, when the general elections came on, he again tendered it. His friends decided to support him in his absence, but the influence of Lord Palmerston's Government was thrown against him and he was defeated. Mr. Cobden was also defeated, and the most prominent representatives of public opinion in the press united in deploring the result as removing from the councils of the nation two of their greatest members. But a vacancy occurring a few months later in the representation of Birmingham, Mr. Bright was invited to become a candidate, and was elected in August, 1857. In the following February, after an absence of two years, much of which had been spent on the Continent, he returned to the House of Commons, and was received with hearty welcome. In a few days he took part in the motion by which Lord Palmerston's ministry was compelled to resign for attempting, in compliance with the request of the French imperial Government, to diminish the privileges enjoyed in Great Britain by political refugees. In March, Lord Derby's ministry, which had succeeded, brought in a bill for the abolition of the East India Company and the transfer of the government of India to the Crown. This course had long before been suggested by Mr. Bright, and he now supported this and other measures of that cabinet, believing them more favorable to the preservation of universal peace than the policy of their opponents. During subsequent ministries the question of parliamentary reform was the most prominent, and on this Mr. Bright occupied an advanced position, urging a wide extension of the electoral franchise. Before this question was settled, however, the outbreak of the Civil War in America tested the wisdom of the statesmen of England in another field. While many of them hastened to announce themselves in sympathy with the "Southern Confederacy," John Bright stood forth conspicuously in defence of the cause of the Union, though his own business and the whole district in which he lived suffered severely from the scarcity of cotton produced by the war. This very scarcity was a confirmation of his statemanlike foresight when in 1847 he directed the attention of the Government to India as a source of supply. With great fortitude the people of the cotton-manufacturing districts, under the leadership of Mr. Bright, endured their privations and refused to help even indirectly a Government which made slavery its corner-stone. When the war ended nearly every prominent man in England found the prophecies he had ventured to make at the outset falsified by its result, while Mr. Bright had the satisfaction both of seeing his own hopes realized and of witnessing the complete overthrow of the social and labor system which had so aroused his antagonism. Almost at the same time he was called to mourn the loss of the partner of his public labors. Mr. Cobden died on April 2, 1865, and when his death was announced in the House of Commons on the following day, Mr. Bright was too much overcome by his feelings to add more than a few words to the eulogies pronounced by Lord Palmerston and Mr. Disraeli, yet these few sentences, full of heartfelt emotion, may well be placed among his most eloquent utterances.

Mr. Bright returned to his labors in behalf of extension of the franchise; he agitated this question just as the repeal of the corn laws had been agitated: meetings were held in which the disfranchised populace joined with the more favored classes in demanding the extension of the right of choosing their legislators. The advocates of this reform had the satisfaction of seeing ministry after ministry promise to address itself to this question; of seeing bill after bill introduced for the purpose; of seeing gradual improvement in the reforms proposed; of seeing the minority in favor of it steadily increasing; and of seeing even the Conservative party, when suddenly called to power, compelled to retrace its steps, to take up the reform measures in earnest, and finally to pass a bill which in some respects went beyond what the Liberal party had previously proposed. To this result the force of Mr. Bright's eloquence and persistence had most effectually contributed, and yet it was evident that he had never proposed to rest content with the end attained, but still looked forward to other reforms—to the constant elevation of the people that they might be worthy of the trust of political power. In December, 1868, Mr. Bright accepted office under Mr. Gladstone as president of the board of trade. He had at last overcome that distrust of his views which had for a long time pervaded English society; he was seen not to be so extreme a revolutionist as his opponents had asserted, but a systematically progressive statesman; the measures which he had advocated were found, when finally accepted, to be beneficial, and not destructive, to the nation. The Government was now ready to carry out measures which he had long before recommended—the disestablishment of the Irish Church, the Irish Land Act of 1870, and the Elementary Education Act. On account of ill-health he was obliged in February, 1870, to forego attendance at Parliament, and though his health was somewhat improved by a rest of six months at Llandudno, yet in December he resigned his office, as being still unable to take part in the work of the following session. In April, 1872, he appeared again in Parliament, bearing the marks of the severe illness through which he had passed, but took no active part in its proceedings. In August, 1873, when Mr. Gladstone reconstructed his cabinet, Mr. Bright was appointed chancellor of the duchy of Lancaster, and he held that post until the defeat of the Liberals at the general election of February, 1874, and the subsequent resignation of Mr. Gladstone from the premiership.

When Mr. Gladstone in April, 1880, was recalled to the post of prime minister, Mr. Bright was again appointed chancellor of the duchy of Lancaster, and retains this office. He has steadily gained the esteem and confidence of the nobility and upper classes, as he has long possessed the affection of the middle and working-classes. Though his career has been more than once interrupted by severe illness, Mr. Bright is robust of frame, broad-chested, and of commanding presence. In his youth he showed manly beauty of true Saxon style; in his age his massive head of white hair adds dignity to his appearance. His voice is of great compass, and he has it under perfect control. His delivery is quiet and undemonstrative, his utterance slow and deliberate. His style is plain and clear; he quickly compels the attention of his hearers by his serious earnestness, and by his manifest frankness carries them with him. His phraseology is often homely, and again often enriched by quotations from the Bible and the great English poets. His speeches are marked with humor rather than wit, yet he has uttered some of the most effective and memorable Parliamentary jests. A notable example occurred in his speech in support of Mr. Gladstone's Reform Bill of 1866, when Mr. Bright described Mr. Horsman, a Liberal member who had refused to support the bill, as having retired into a "political cave of Adullam and called about him every one that was in distress and every one that was discontented;" and again in the same speech, where he compared the new party of two members to "the Scotch terrier, which was so covered with hair that it was impossible to tell which was the head and which the tail." The familiarity of his illustrations gives them universal currency, and the tone of his voice often adds immensely to the scorn or the pathos implied in his words. But his strength lies in his manifest firm conviction of the righteousness and expediency of the measures he advocates. (J. P. L.)

BRISTOL, a village of Hartford co., Conn., is 17 miles W. of Hartford, on the New York and New England Railroad. It has four hotels, two banks (one national), two weekly newspapers, seven churches, and thirteen schools. There are two foundries, three grist-mills, and numerous manufactories of clocks, cutlery, water-wheels, marble monuments, harness, knit goods, etc. It was settled in 1785. Its property is valued at $2,000,000; its public debt is $20,000, and its expenses for 1881 were $35,000. Population, 2763.

BRISTOL, a borough of Bucks co., Pa., is on the Delaware River, 20 miles N. E. of Philadelphia, and 69 miles from New York, on the New York and Trenton division of the Pennsylvania Railroad. It is also the terminus of the Delaware and Lehigh Canal, by which large quantities of coal are transported to the Delaware River. On the opposite side of the river is Burlington, N. J., with which there is communication by a steam-ferry. Bristol has four hotels, a national bank, two weekly newspapers, ten churches, four public schools, two seminaries, and denominational schools. The industrial works comprise an iron-foundry, two machine-shops, cotton-mills, hosiery-mill, worsted-mill, cloth-mill, felt-mill, soap-factory, keg-factory, grist-mill, two planing-mills, saw-mill, and paper-mill. The town is handsome, is lighted with gas made from petroleum, and has water-works which cost $39,000. The first settlement was made here in 1681, and was known as Buckingham till 1699, when the town of Bristol was laid out. It was incorporated in 1720, and two years later chalybeate springs were discovered here which attracted hundreds of visitors annually. Population, 5273.

BRISTOL, a city of Sullivan co., Tenn., partly also in Washington co., Va., is 130 miles N. E. of Knoxville, and is the terminus of the Norfolk and Western Railroad and of the East Tennessee, Virginia, and Georgia Railroad. The surrounding country abounds in coal, iron, copper, zinc, and lead. Bristol has good hotels, a national bank, three weekly newspapers, three colleges, and eight churches. Beaver Creek, traversing the town, affords ample water-power, which is used in cotton- and woollen-mills, flour-mills, foundries, etc. Total population, 3209.

BROCADE. This term, applied chiefly and properly to silk stuffs and mixtures containing silk, appears to have been introduced into England with the trade in Flemish goods during the fifteenth and sixteenth centuries. It is derived from the Spanish *broca*, signifying the reel on which embroiderers wind their thread. Until the invention of the Jacquard attachment to the loom in the year 1801, embroidered silk goods were called brocades. After that date a distinction arose between silks figured in the loom and those which are embroidered after being woven. Thenceforward, embroideries came to be classed by themselves, and figured silks, woven by means of the Jacquard apparatus, were designated as brocades. This distinction will be employed in the present article. The word "brocade" is, however, often used to denote not only a figured silk or silk mixture, but also a thick or heavy tissue.

From the returns to the United States census of 1880 it is computed that the value of piece silks made by the Jacquard apparatus (brocades) was $7,107,095, or more than 60 per cent. of the whole production of broad goods, which was constituted as follows:

Dress goods and satins	$5,217,080
Tie silks and scarfs	606,675
Millinery silks	891,955
Handkerchiefs	3,881,590
Linings and other broad goods	627,595
Mixtures	519,643
Total	$11,744,538

For convenient comparison the exports from France of plain and figured silks are presented for the same year, 1880. Ribbons and embroideries are excluded from both categories:

	Plain silks.	Figured silks.
Exports from France	$18,375,900	$2,938,014
Production in the United States.	4,637,443	7,107,095

The chief seats of the industry in the United States are in Hartford co., Conn., Passaic and Hudson cos., N. J., and the cities of New York and Philadelphia, at least one-half of all the figured goods being made at Paterson, N. J.

BROCKPORT, a village of Monroe co., N. Y., is 17 miles W. of Rochester, on the New York Central Railroad and on the Erie Canal. It contains four hotels, two banks (one national), three weekly newspapers, seven churches, a State normal school, three common schools, and a public library. It also contains extensive manufactories of agricultural implements, planing-mills, flour-mills, and carriage-factories. The village, named from Hiel Brockway, a former owner of the site, was incorporated in 1829. Population, 4039.

BROCKTON, a town of Plymouth co., Mass., is 20 miles S. of Boston, on the Old Colony Railroad. It has two banks (one national), five hotels, three weekly and two daily newspapers, ten churches, several schools, and a good fire department. Its manufactures comprise boots, shoes, carriages, furniture, and machinery. It was incorporated in 1821 under the name of North Bridgewater, but in 1875 the name was changed to Brockton. Population of township, 13,608.

BROCKVILLE, a port of entry and chief town of Leeds co., Ont., on the St. Lawrence River, at the foot of the Lake of the Thousand Islands, 125 miles S. W.

of Montreal and 75 miles by rail S. of Ottawa. It is on the Grand Trunk Railroad, at the S. terminus of a branch of the Canadian Pacific Railroad, which extends to Ottawa. It is lighted with gas, has a custom-house, two newspaper-offices, several tanneries, flour-mills, and manufactures of hardware, machinery, chemicals, white lead, farming implements, gloves, sash, blinds, etc. Brockville is connected by steam-ferry with Morristown, N. Y. Population, 7609.

BROGLIE, Charles Jacques Victor Albert, Duc de, a French statesman, was born in Paris, June 13, 1821. He was educated at the University of Paris, where he gained at an early age a high reputation. He became an editor of the *Correspondent*, in which he defended Catholic interests and advocated a moderate liberalism. After 1848 he withdrew from public life, in consequence of his political opinions, until 1871. In 1862 he was elected a member of the French Academy. On the death of his father, Jan. 25, 1870, he succeeded to the title of duc de Broglie, and in the following year he was elected to the Assembly. In March, 1872, he was appointed ambassador to England, but as the nomination gave dissatisfaction to the republicans, he was quickly recalled. Re-entering the Assembly, he became the leader of the opposition to the Thiers Government, and combated it with such persistence as to compel Pres. Thiers to resign. On the accession of Marshal MacMahon in May, 1873, De Broglie, as a prominent adherent of the royalist and Orleanist cause, was called to form a cabinet, in which he took the ministry of foreign affairs, but was forced to resign by an adverse vote of the Assembly, May, 1874. Returning to the Assembly as a member of the Right Centre, he was elected a senator for a term of nine years in January, 1876. He continued in the senate to oppose all republican measures, and in May, 1877, was again called to form a Conservative cabinet, in which he held, with the presidency of the council, the post of minister of justice. He immediately prorogued the Chamber and called for a new election, in which the Government used every means in its power to aid the return of royalist deputies. Great popular dissatisfaction followed, and a strong republican majority was returned. On the meeting of the Chambers a commission of inquiry into the election was immediately voted, and five days afterwards (Nov. 20, 1877) the ministry resigned.

The literary works of the duc de Broglie consist of a translation of Leibnitz's *Systema Theologicum* (1846); *Études Morales et Littéraires* (1873); *L'Église et l'Empire Romain au Quatrième Siècle* (4 vols., 1856–59), which is his most important work. In continuation of it he has also written essays on Julian the Apostate and Theodosius the Great. He has also published *Une Réforme Administrative en Algérie* (1860); *Questions de Réligion et d'Histoire* (2 vols., 1860); *La Souveraineté Pontificale et la Liberté* (1861); *La Liberté divine et la Liberté humaine* (1865). Under the title *Le Secret du Roi* (1878) he has published many family papers and other documents relating to the secret diplomacy of Louis XV. from 1752 to 1744.

BROOKE, Stopford Augustus, an English clergyman, was born in Dublin in 1832. He was educated at Trinity College, whence he graduated in 1856, took his master's degree in 1858, and was curate of St. Matthew's, Marylebone, London, 1857–59; was curate of Kensington 1860–63, and minister at the chapels of St. James and Bedford 1866–75. In 1872 he was made a chaplain in ordinary to the queen. He left the Established Church in 1880. His published works consist of *Life and Letters of the late Frederick W. Robertson* (1865), *Theology in the English Poets* (1874), *A Primer of English Literature* (1875), *Freedom in the Church of England* (1871), and *Sermons* (4 vols., 1868–77). He is also the author of *Milton* in the series of "Classical Writers" (1879), *Faith and Freedom* (1881), and *The Spirit of the Christian Life*, sermons (1881).

BROOKFIELD, a city of Linn co., Mo., is the middle point of the Hannibal and St. Joseph Railroad, 104 miles W. of Hannibal. It has a large round-house, with machine- and car-repair works, two large hotels, a bank, six churches, two public schools, and an academy. Two weekly newspapers are published here. It was laid out in 1858, and is incorporated as a city of the fourth class. Population, 2264.

See Vol. IV. p. 331 Am. ed. (p. 370 Edin. ed.).

BROOKLYN, a city in the State of New York, and the third in the United States in population, has an area of 24$\frac{9}{10}$ square miles. In shape the city resembles an open fan, with its base resting on the East River. Its exterior line measures 22 miles, $8\frac{1}{2}$ miles fronting on the water; its extreme length, north and south, is about $7\frac{3}{4}$ miles, and its greatest breadth 5 miles; but the average extent either way is much less. The present city of Brooklyn was incorporated in 1855; it comprises the former cities of Brooklyn and Williamsburg and the town of Bushwick. (Bushwick is now used to designate the eastern portion of the old town of that name, while the northern portion is called Greenpoint.) The old city of Brooklyn, as it existed before 1855, is commonly called the Western District, and the old town of Bushwick (including the city of Williamsburg), the Eastern District. The population of the consolidated city of Brooklyn was 205,280 in 1855, 266,661 in 1860, 296,112 in 1865, 396,099 in 1870, 482,493 in 1875, 566,689 in 1880, and in June, 1883, 690,000.

The assessed value of real estate in Brooklyn was \$183,822,789 in 1870, and \$283,500,000 in 1883 (the assessment of 1883 being 70 per cent. of the market value); the value of personal estate in the city was \$17,388,070 in 1870, and \$21,000,000 in 1883. The tax-levies for 1870 amounted to \$1,331,257 for State, \$1,680,259 for county, and \$4,576,969 for city purposes—an average of \$3.77 on each \$100 of valuation; the tax-levies for 1883 were \$2,377,676.18 for State, county, and collection purposes, and \$5,408,847.09 for city purposes, making a total of \$7,786,522.27—being an average of \$2.52 per cent. on the valuation.

Brooklyn, for the most part, is considerably elevated above tide-water. At the time of its settlement the territory was ragged and broken. Along the shore opposite the lower part of New York City an irregular bluff, now known as The Heights, rose abruptly from the water's edge, but the shore north and south of this bluff was low and marshy, indented by numerous creeks and inlets, upon which many tide-mills were located. From the shore towards the east there was a constant succession of abrupt hills and deep hollows until quite an elevation was reached, while the south and east borders of the present city were occupied by a broad range of low hills extending into Queens county. A harbor- and pier-line has been established by the State legislature, and a large area of land has been recovered from the adjoining river and bays. In the district known as Gowanus the bay and creek of that name formerly extended very far into the southern portion of Brooklyn, but the marsh-lands have been reclaimed, and the creek has been made a canal about one mile in length, capable of receiving vessels of light draught. In the south-western portion of the city, at Red Hook, are situated three large basins or enclosed docks, belonging to private corporations: the basin of the Atlantic Dock Company, which covers an area of 40 acres of water; the Erie basin, with an area of about 60 acres of water; and the Brooklyn basin, with an area of about 40 acres of water. These basins can receive vessels of any size, and are surrounded by large warehouses. The marsh-lands about Wallabout Bay, a deep indentation lying between the old cities of Brooklyn and Williamsburg, have also been reclaimed, and a basin formed which has added about three-fourths of a mile to the wharfage of the city. Upon Wallabout Bay is situated the U. S. navy-yard. The first purchase of land was made in 1801, and now the United States owns nearly 200 acres of land. The yard proper occupies 45 acres, and is enclosed by a high brick wall. It contains a very large dry dock, erected at a cost of $2,113,173, and capable of receiving ships 300 feet long. Within the navy-yard are large marine barracks, houses for the officers, machine-shops, warehouses, stores for munitions of war, and several marine railways, and also the United States Naval Lyceum, containing a library and valuable collections of minerals, relics, and curiosities. Upon an eminence to the east of the navy-yard stands the U. S. Marine Hospital. A much larger portion of the water-front than was needed being occupied by the United States for its navy-yard, several efforts have been made by the city to purchase a part or to exchange lands needed by the United States for it. The matter is not yet (June, 1883) concluded. Bushwick Creek, between Greenpoint and Williamsburg, and Newtown Creek, the northern boundary of the city, have been improved, and the latter is navigable for more than a mile for vessels of light draught. The water-front of the city belongs almost entirely to private individuals and corporations, and but very few docks are owned by the city. Along the water-front are situated large warehouses, grain-elevators, ship-yards, sugar-refineries, oil-works, and various manufactories. The shipping arriving at and departing from Brooklyn docks is to that of New York City as 9 to 7; the storage of grain, sugar, flour, and petroleum is 76 per cent. of the whole; while that of general merchandise is about 56 per cent.; but Brooklyn, being a part of the port of New York, its commerce is not reckoned separately.

The intimate connection between New York and Brooklyn creates an immense ferry-travel. The earliest ferry was established soon after the first settlement, and ran from the present Fulton Street, Brooklyn, to Peck Slip, New York. Previous to 1814, when Robert Fulton leased the ferries and applied steam, the boats used were row-boats, flat scows with sprit sails, two-masted sail-boats, and horse-boats. Four ferry companies, owning nine ferries (one, the Union Ferry Company, owning five), run boats between the two cities constantly during the day and night. The number of persons who crossed these ferries was over 75,000,000 in 1882. During the same year 23,000,000 persons crossed the Fulton Ferry. Two ferry companies run boats between Brooklyn and Jersey City, and connect with the various railroad and steamboat lines on both sides of the Hudson River. The necessity of a better means of intercourse between the two cities, free from the delays caused by ice, fogs, and the passage of vessels, compelled the building of a bridge over the East River. In 1803, in 1829, in 1836, in 1841, in 1856, and in 1865 projects, some of them very elaborate, were published for a bridge. That of 1865 was for a tubular suspension bridge, and was the result of ten years' study by the eminent engineer Col. J. W. Adams. This led to the passage of the Bridge Act of April, 1867, under which the building of the bridge was commenced, but the corporators preferred an engineer of larger experience in bridge-building, and employed Col. J. A. Roebling, the engineer of the Niagara and Cincinnati suspension bridges: and after he had spent a year in perfecting his plans they were approved by the Government commission and by a consulting board of eight eminent engineers, and work was commenced on excavations for the towers in the spring of 1869, but was soon interrupted by the death of Col. Roebling from lockjaw, the result of an accidental injury to his foot. He was succeeded by his son, Col. W. A. Roebling, who had been his able assistant in all his labors and plans. Work was resumed in 1870, the caissons built and sunk, the excavations made, and the caissons filled and perfect foundations prepared for the towers. During the progress of this work Col. Roebling was disabled from active personal supervision of the work by the "caisson disease," but continued his thorough superintendence of it, by the aid of his accomplished wife, from his sick chamber till its completion, May 24, 1883. The original estimate of the cost of the bridge, exclusive of the land, was $5,000,000, of which $3,000,000 was subscribed by Brooklyn, $1,500,000 by New York City, and $500,000 by private stockholders. This estimate was raised to $7,000,000 in 1869, and eventually, by the great increase in the cost of material, delays from various causes, a change of organization, vexatious litigation, the increased height of the structure, the cost of land, etc., etc., its cost was culminated to about $15,500,000—a sum, however, proportionally less than that of any similar structure. It is the largest suspension bridge in the world, its extreme length being 5989 feet = 1⅛ miles. Of this distance, the two approaches from Brooklyn and New York comprise 2533½ feet (Brooklyn 971, and New York 1562½ feet); the river-span, 1595 feet 6 inches. The two towers over which the four suspensory cables are stretched are 278 feet above tidewater, and have a foundation 78 feet deep on the New York tower and 45 feet on the Brooklyn. They are 159 feet above the bridge roadway, 140 × 59 feet at high-water line, and 137 × 53 at the roof-course. The cables, composed each of 5296 parallel galvanized steel oil-coated wires, wrapped into a solid cylinder by closely-wound wire, trebly painted, are each 15¾ inches in diameter, and contain (exclusive of the wrapping wire) 14,361 miles of wire. The clear height of the bridge in the centre of the river is 135 feet above high water; width of bridge, 85 feet. It is divided into an elevated footpath, two wagon roadways, and two railroad-tracks. The cars are to be drawn by an endless chain moved by stationary engines. Its opening occurred May 24, 1883. It is built thoroughly, and there is no sagging or vibration. It is to be connected with railroad routes at both extremities. (See BRIDGES, this volume.)

There are 14 street-railroad companies in Brooklyn, with 37 lines; one company owns 12 lines, and another 6. In 1881 these companies owned 157·38 miles of tracks, 1538 cars, 37 dummy engines, and 5843 horses, and they carried 80,194,574 passengers. In addition, there are two lines of stages and cabs. Nine steam railroads connect the city with different portions of Long Island. The principal one of these is the Long Island Railroad, whose main line runs from Hunter's Point, or Long Island City, separated from Brooklyn by Newtown Creek, to the eastern end of Long Island, and which has two branches in the city proper. In 1883 it operated 367·12 miles of track, part of which was leased, owned 84 locomotives and 770 cars, and carried 7,458,141 passengers. The other steam railroads connect Brooklyn with the sea-shore in Kings and Queens counties. In 1883 they owned 34·20 miles of track, 28 locomotives, and 256 cars, and carried 2,500,000 passengers. As a rule, they are in operation only from April until November. Two elevated railroads have been incorporated (1883), but the line of one is not completed, and the other not begun. An underground railroad has also been chartered, but no steps have been taken to forward the project.

Brooklyn has more manufacturing establishments than any other city in the United States except New York and Philadelphia. The total number, according to the census of 1880 (last revision including all), was 5272; their capital, $77,700,249; average number of hands employed, 40,464 males, 7221 females, 3636 children; annual amount of wages paid, $24,340,194; value of material, $145,294,097; value of yearly product, $199,764,561. The great increase of sugar- and petroleum-refining, ropes and cordage, hats, etc., etc., since 1880 make the total product in 1883 over $250,000,000. Sugar-refining yielded $59,711,168 in 1880, now over $100,000,000; petroleum-refining in 1880, $15,115,293, now over $20,000,000. The greatest number of manufactories (546) were of boots and shoes. Hard porcelain (1) is not produced elsewhere in America. There are 11 banks in the city, 1 trust company, and 2 safe-deposit companies. The resources of the 14 savings banks of Brooklyn on June 30, 1882, were $76,182,717.38; their deposits, $66,444,495.14; their surplus, $9,722,000.85; their open accounts, 179,309. The city also contains 2 life-insurance and 10 fire-insurance companies, and 8 gas companies. Gas was introduced into the city in March, 1848. Brooklyn still depends upon New York in some measure for its amusements, but has 8 regular theatres, as well as several large halls. The Academy of Music, the largest hall or theatre, contains seats for nearly 2500 persons. The Art Association holds two public exhibitions of pictures annually. There is one large circulating library, the Brooklyn, containing 67,000 volumes; one large reference library, the Long Island Historical Society; one law library; and many small libraries. There are six prominent social clubs, eight boat and yacht clubs, and twelve scientific associations. The first newspaper established in Brooklyn was published in 1799, and now there are 16 papers, all devoted to local interests. Among these are 4 daily evening newspapers of large circulation.

The public schools of Brooklyn are under the control of a board of education of forty-five members, appointed by the mayor to serve three years. This board appoints a superintendent of schools and two assistants. The schools are classified as grammar, intermediate, and primary; and the most difficult problem is to accommodate the primary scholars. In 1881 there were 42 grammar and intermediate schools, 10 primary schools, 4 colored schools, and 2 attendance schools; 96,077 children received instruction, and 1289 teachers were employed. In April, 1882, 60,876 pupils were registered, and there were 64.262 sittings. Nine orphan asylums of this city are partially under the control of this board, and there were 1697 scholars in these institutions on Dec. 31, 1881. Evening schools are open during four months in the year; in 1881 there were 13 such schools, including 2 for colored persons, and their cost was $25,000. The amount paid to teachers in 1881 was $778,617.65, and the total cost of public schools was $1,094,923.43. Connected with this school system is a truant home, where 221 boys were lodged and instructed during 1881. The private schools in Brooklyn numbered 305 in 1880.

The private benevolent institutions in the city are very numerous: among them are 10 orphan asylums, 4 nurseries, 17 hospitals, 20 dispensaries, 18 homes for the aged and disabled, and some 38 other benevolent and aid societies. There are also 79 Masonic lodges, 55 Odd Fellows' lodges, and about 150 other secret and benevolent societies. The public charities of Kings county are the almshouse, the insane asylum, and a nursery (all located at Flatbush), and the penitentiary.

Brooklyn has long been called the "city of churches." In 1660 the first church was organized, and in 1666 the first church edifice was erected within the present limits of Brooklyn. The early churches belonged to the Dutch Reformed Church, and until about 1790 were under the direct supervision of the Classis in Holland. The following table shows the number of churches, their membership in 1882, and date of first organization:

	No.	Members.	Date.
Methodist	53	13,469	1794
Presbyterian	27	11,860	1822
Congregational	21	9,304	1844
Episcopal	36	11,512	1784
Baptist	32	11,201	1822
Dutch Reformed	16	4,667	1660
Lutheran	14	4,600	1847
Universalist	3	500	1842
Unitarian	3	500	1833
Jewish	6	360	1856
Miscellaneous	21	3,500	
Roman Catholic	44	100,000	1822
	276	171,473	

The number of beautiful churches in the city is very large: among them are Holy Trinity, St. Ann's, St. Paul's, Christ Church (in the Eastern District), Grace Church (in the Eastern District), Episcopal; the Pilgrim's, Congregational; St. John's, Methodist; St. Charles Borromeo and St. Stephen's, Roman Catholic. In May, 1868, the corner-stone of a Roman Catholic cathedral, which will occupy an entire block, was laid; only a very small portion has, however, been completed.

In Brooklyn and the territory adjoining in Kings and Queens counties are situated 7 public cemeteries and a large number of private ones belonging to various religions and benevolent societies. Greenwood, the largest, famed for its beauty and its handsome monuments, was organized in 1838, and contains 450 acres. Its paths are over 17 miles in length, and its stone-bedded avenues 20 miles. It has 4 miles of pipes supplied from the city waterworks, 8 lakes, and 16½ miles of sewers connecting with 1140 receiving-basins. The annual number of interments of late has been between five and six thousand, and the total number on Jan. 1, 1882, was 210,994, while the number of lots sold was 23,719. The receipts for 1881 were $424,910.93, and the expenses $417,470.49. Cypress Hills Cemetery, about one mile east of the city, was organized in 1847. It occupies an elevated ridge of land, and contains about 400 acres. Here are buried some 4000 soldiers, and upwards of 35,000 bodies transferred from burial-lots in New York City. The total number of interments is 103.454. The cemetery of the Evergreens, on the eastern border of the city, was incorporated in 1849; it contains 275 acres. The total number of interments is 7946. The Roman Catholic cemetery of the Holy Cross at Flatbush contains 36 acres, in which 35,000 interments have been made.

The city is governed by a mayor and a board of aldermen of twenty-five members, one from each ward, elected to serve two years. The principal departments of the city government are fourteen—viz., those of finance, treasury, audit, law, city works, assessment, collection, arrears, police and excise, health, buildings, parks, and public instruction. Of these the comptroller, who is head of the finance department, and the auditor are the only officials elected, all the others being appointed by the mayor. The existing system is of recent establishment. By an amendment to the charter passed May 25, 1880, which took effect on Jan. 1, 1882, a radical change was instituted. The mayor, whose term of office is two years, is directly responsible for the government of the city; he has full power to appoint the great majority of the city officials, and the right of confirmation by the aldermen no longer exists. The power of removal is not as free, each official having a right to appeal to the general term of the supreme court from the decision of the mayor. The finance, treasury, and audit departments have charge of the finances and the money received and paid out by the city. The assessment, collection, and arrears departments levy and collect the taxes. The expenditure of the city is determined by the board of estimate, composed of the mayor, comptroller, auditor, county treasurer, and supervisor-at-large, who receive and act upon the estimates furnished by the different departments and officials, and their final report is revised by the board of aldermen, who may reduce, but cannot increase, the amounts appropriated. The appropriations for the year 1882 were $6,048,010.61. The total debt, Dec. 31, 1882, was $42,165,051.19, with a sinking fund of $4,671,327.79, leaving the net debt $37,493,723.40.

The water-supply of the city is public, and is in charge of the department of city works. The water was introduced in 1858, and is obtained from the watershed of Long Island, formed by the irregular ridge of low hills which extends from New York Bay to Montauk Point. It is brought in a brick-covered conduit to the reservoir at Ridgewood, on the eastern border of the city, into which it is forced by three powerful engines; a fourth will soon be added. The farthest pond used is $19\frac{3}{10}$ miles from the city hall. The Ridgewood reservoir is 170 feet above sea-level, and has a capacity of 160,000,000 gallons. Connected with the distribution of water is Mount Prospect reservoir, at the main entrance of Prospect Park, which holds about 20,000,000 gallons. A storage reservoir has also been recently built at Hempstead with a capacity of about 1,055,000,000 gallons. The revenue derived from the water-tax in 1881 was $917,045.46; 55,363 houses and 21,556 rear buildings were supplied with water, and the average daily consumption was 32,862,398 gallons. The water-supply is to be increased during the year 1883.

The paid fire department was introduced in Brooklyn in 1869. On Jan. 1, 1882, the force and apparatus employed consisted of 256 men, 76 horses, 21 engines, 24 hose-tenders, 7 hook-and-ladder trucks, and 120 miles of telegraph-wire on poles of its own: it also used 20 miles of wire belonging to different telegraph companies. The total number of fires during 1881 was 437, with a loss of $927,145. In 1848 occurred the largest fire known in the history of Brooklyn, which destroyed seven blocks in the heart of the city. On Dec. 5, 1876, occurred the fire most destructive of life: on that night, in the midst of the performance before a crowded house, the Brooklyn Theatre took fire, and 295 persons perished. Until 1870 the police force of Brooklyn was incorporated with that of New York City. The head of the police department is now appointed by the mayor. In 1882 the force consisted of 1 superintendent, 1 inspector, 14 captains, 64 sergeants, 32 roundsmen, 25 detectives, 480 patrolmen, and 33 doormen. During the same year 27,758 arrests were made; 1915 lost children were recovered; property valued at $107,840.24 was received, and property valued at $96,296.16 restored to the owners. The inspection of steam-boilers is also under the control of the police department. The board of excise during 1882 granted 2776 liquor licenses.

Brooklyn is part of the second judicial department of the State, in which are elected five judges of the supreme court. The other courts are the city court of Brooklyn, with three judges, the county court and court of sessions, four police justices, and three justices of the peace; and also the U. S. district and the U. S. circuit courts for the eastern district of New York State.

The health of the city is considered above the average. The rate of mortality per 1000 was 25·84 in 1875, 24·76 in 1876, 22·10 in 1877, 20·85 in 1878, 21·08 in 1879, 23·33 in 1880, 24·83 in 1881, and 24.97 in 1882.

The total number of buildings in the city in December, 1882, was 81,180, an increase of 4315 in two years. Among the structures worthy of special notice are those of the Long Island Historical Society, probably the finest in the city, the Art Association, the Brooklyn Library, the Academy of Music, the Garfield building, and the new Dime Savings Bank building. The public buildings consist of the city hall, built in 1845–46; the municipal building, opposite the city hall, built in 1876; the court-house, adjoining the municipal building, built in 1862; the jail, situated near Fort Greene; and the county penitentiary, in the south-eastern part of the city. (This penitentiary is self-sustaining; its earnings for 1881–82 were $73,688.99, and its expenditures $62,957. The prisoners are engaged chiefly in making shoes under a contract with a private corporation.) A building is soon to be erected by the U. S. Government for the use of the post-office, the U. S. courts, etc., $800,000 having been appropriated for it by Congress.

One of the most charming features and greatest attractions of Brooklyn is found in its public pleasure-grounds. These are the City Park, near the navy-yard, covering 7 acres; Carroll Park, in South Brooklyn, covering 2 acres; Tompkins Park, near the centre of the city, covering 8 acres; Washington Park, or Fort Greene, a short distance east of the city hall, covering 30 acres; and Prospect Park, the principal park of the city. The last was suggested by the success of Central Park in New York City, and was laid out by the same landscape-gardeners, Olmstead, Vaux & Co. A commission was appointed in 1859 which reported plans for three large and five small parks and a parade-ground. The great cost of Prospect Park has prevented the completion of the other two large parks. Prospect Park is situated on Mount Prospect, an elevated ridge in the southern portion of the city adjoining Flatbush, and contains, with the parade-ground, 550 acres. The cost of the land was $5,000,000, and nearly $5,000,000 have been expended in improvements, exclusive of the cost of maintenance. The site of the park had great natural advantages—a magnificent view of the city and the harbor, fine wooded hills, and a rolling country. It contains a lake of about 50 acres, a zoological garden of 25 acres, lawns for field-sports, and picnic-grounds. It is also proposed to erect an observatory and a museum. The drives in the park cover 6 miles, the riding roads 3 miles, and the foot-paths 11 miles. For the last few years about 4,000,000 persons have visited the park annually. (S. W. G.)

BROOKS, CHARLES TIMOTHY (1813–1883), an American author, was born at Salem, Mass., June 20, 1813. He graduated at Harvard College 1832, and at Cambridge Divinity School 1835. He became pastor of the Unitarian church at Newport, R. I., in 1837. He resigned his pastoral charge in 1873 on account of impaired eyesight, and devoted himself to literary pursuits, chiefly to translating from the German. His principal works are—a translation of Schiller's *William Tell* (1837); Schiller's *Homage of the Arts*, etc. (1847); *German Lyrics* (1853); Goethe's *Faust*, Part 1st (1857); *Twenty-five Sermons: The Simplicity of Christ's Teachings* (1859); *The Jobsiad*, from the German (1863); Richter's *Titan*, 2 vols. (1864); his *Hesperus*, 2 vols. (1865); *Layman's Breviary*, by Leopold Schefer (1867); *World-Priest*, from Schefer (1873); and Rückert's *Wisdom of the Brahmins* (1883). He also published a number of minor poems. He was especially successful as a translator from the German. He died at Newport, June 14, 1883.

BROOKS, REV. PHILLIPS, D. D., an American author and a clergyman in the Episcopal Church, was born in Boston, Dec. 13, 1835. He entered the Latin School in 1846, and thence entered Harvard College in 1851, graduating in the year 1855. Immediately after his graduation he taught for a year in the Boston Latin School. In 1856 he entered the theological seminary at Alexandria, Va., and was ordained deacon in the year 1859. On his ordination he entered upon his duties as rector of the Church of the Advent in Philadelphia. In 1862 he accepted a call to the rectorship of the Church of the Holy Trinity in the same city, succeeding his former pastor in Boston, the Rev. Alexander H. Vinton, D. D. In the year 1869 he accepted a call to become the rector of Trinity Church, Boston, after the retirement of the Right Rev. Manton Eastburn. In Nov., 1872, Trinity Church was destroyed in the great Boston fire, and the congregation worshipped in Technological Hall until the new Trinity Church was completed in Feb., 1877. In the spring of 1881, Dr. Brooks was elected Plummer professor of Christian morals and preacher to the university in Harvard College, to succeed the Rev. A. P. Peabody, D. D. This position he declined. In the summer of 1882 he took a year's vacation in Europe.

Dr. Brooks has published the following works: a volume of *Sermons* (1878); *Lectures on Preaching*, before the Divinity School of Yale College (1879); *The Influence of Jesus*, a course of lectures on the John Bohlen foundation in the Church of the Holy Trinity, Philadelphia; and *The Candle of the Lord and Other Sermons* (1881). Dr. Brooks has also written a preface to a collection of thoughts from Dean Stanley's writings.

BROOKVILLE, the county-seat of Jefferson co., Pa., is at the head of Red Bank Creek, 102 miles N. E. of Pittsburg, on the Low-Grade division of the Alleghany Valley Railroad. The town, finely situated on a hillside, has five hotels, two banks (one national), three weekly newspapers, seven churches, and eight schools, with a fine public-school building. It has three foundries, two woollen-mills, three flour-mills, three saw-mills, three planing-mills, and engine- and boiler-works. It was settled in 1830 and incorporated in 1832. It is in a lumber and bituminous coal region, and has an agricultural society. Population, 2136.

BROTHERS OF THE CHRISTIAN SCHOOLS, an order in the Roman Catholic Church devoted to the gratuitous instruction of youth. It was founded by Jean

Baptiste de la Salle (1651–1719), a native of Rheims in France, a person of illustrious lineage and great moral excellence. Perceiving that the training of the children of the poor was sadly neglected, and that for want of proper guidance, both mental and moral, they were in danger of falling into the gross immoralities of the time, La Salle conceived the idea of establishing schools for their proper instruction. The rich had universities and colleges sufficient to meet their requirements, but education with the poor was at the lowest possible ebb. To remedy this evil, La Salle collected about him men of kindred spirit, and after drawing up rules for their guidance by which they were forbidden to take holy orders, he and twelve others on the 6th of June, 1694, in a modest little chapel at Vaugirard, near Paris, took the prescribed vows and began the great work of establishing free schools for the poor. They inaugurated a new system of education, the "mutual-simultaneous." La Salle deemed the true basis of knowledge to be reason and judgment, and laid a particular importance upon the study of the vernacular. Before his time Latin had been the basis of all studies, and pupils would be grounded in it before they even understood the mother-tongue. He reversed the order of studies, without, however, neglecting the higher branches. The system commended itself to such public favor that it soon brought trouble to the door of the brotherhood; for hardly had they begun their work when the general school- and writing-masters united in a petition to the French Parliament asking for an indictment against the brothers, for their gratuitous system had deprived these teachers of employment. The Parliament issued a decree against the brothers, forbidding them to receive into their schools other children than those whose fathers were notoriously poor, and to teach them only the branches proportioned to the condition of their parents. These restrictions hindered the brothers in the prosecution of their system and retarded the advancement of the schools. Yet at the death of La Salle in 1719 there existed in various parts of Europe 28 schools, maintained by 274 brothers, wherein 9885 pupils were taught. In 1725 the order was approved by Pope Benedict XIII. At the outbreak of the French Revolution the Constituent Assembly suppressed all religious congregations, and Brother Agathon, the superior-general of the brotherhood, fearing that the savage fury of the mob then in power might be turned against the order, addressed the Assembly, maintaining that the institution existed only for the people, its members having abandoned everything in order to devote themselves to popular education; and that the dispersion of the order would deprive the children of their teachers and the teachers of their living. But the Assembly on August 18, 1792, passed a decree in which, although paying a tribute to the worth of the order by declaring that they merited the gratitude of the country, they ordered that the brotherhood be annihilated, its members dispersed, and its property confiscated. This decree being carried into effect, the schools were broken up in the cities. Though dispersed and deprived of their property, the brothers did not abandon the children of the poor, but, scattering themselves here and there in the villages and hiding under the secular dress, continued secretly to teach. Some went to other cities and founded new establishments.

The banishment from France was of but short duration, for when Napoleon seized supreme power the brothers, taking courage, emerged from their hiding-places, and in 1804 openly resumed their schools. Napoleon assisted and protected them, a restoration followed, and their work progressed with wonderful success. Novices flocked to their houses asking admittance to the brotherhood, new schools were continually opened, and the poor under their care rapidly rose to a degree of educational excellence never known before. Evening schools were opened for the education of adults, and thousands of workingmen devoted their leisure hours in listening to the instructions of the brothers. When the war between France and Germany broke out in 1870 the brothers were called upon to undertake the duties of nurses in the hospitals and in the field, and throughout that period, and during the insurrection of the Commune that followed it, so noble were their labors that the duc de Noailles, director of the Academy, in the session of Aug. 8, 1872, conferred on them the prize of courage, devotion, and self-sacrifice.

After establishing houses all over Italy, Belgium, Germany, Austria, Switzerland, Spain, England, and Ireland, in 1837 they landed upon the banks of the St. Lawrence and commenced their work in America. In 1846 they founded schools in Baltimore, in 1848 in New York, and in 1851 in Philadelphia. They now conduct flourishing schools and colleges in the Dominion of Canada, where a vast number of pupils are taught. In the province of the United States, consisting of the districts of New York, Baltimore, San Francisco, and St. Louis, they have under their control and management 9 colleges endowed with university privileges, 5 academies, 48 parochial schools, 4 asylums, 2 industrial schools, 1 institute, and 1 protectorate, wherein nearly 1200 brothers instruct 24,039 pupils. The brotherhood has established itself in Chili, Ecuador, Madagascar, the Seychelles, British India, Cochin China, and China. In 1878 the brotherhood throughout the world had under their control 1268 houses, 11,888 brothers, 1365 novices, and 378,798 pupils. (F. H.)

BROUGHAM, JOHN (1810–1880), actor and playwriter, was born in Dublin, Ireland, May 9, 1810. While he was yet a child his father died, but he had good advantages for education, and graduated with honor at Trinity College, Dublin. He began to study medicine, but, being thrown upon his own resources, went to London, where for a time he taught drawing, but finally became an actor. His first appearance was at Tottenham Theatre in 1830 in the play of *Tom and Jerry*. While employed at the Olympic Theatre he composed his first burlesque, *Life in the Clouds*, for Mr. W. E. Burton, afterwards famous as a comedian. He also assisted Mr. Dion Boucicault in composing *London Assurance*. He became manager of the London Lyceum, and wrote for it several successful plays. But his management having involved him in financial trouble, he came to America in 1842 to retrieve his sunken fortunes. After making a professional tour through the leading cities, he settled down for a while in New York in connection with Burton's Theatre, and wrote a number of comedies, among which were *The Irish Emigrant*, *All's Fair in Love*, etc. In 1850 he opened Brougham's Lyceum, which soon became Wallack's Theatre, and brought out several new plays. After managing the Old Bowery Theatre for the season of 1856–57, he returned to Wallack's. During all this time he was busily employed in writing new plays, some of which, as *Pocahontas* and *Columbus*, were extravagant burlesques, while several, as *Romance and Reality* and *Playing with Fire*, were of a higher order. In 1861 he went to London, where he spent five years, achieving great success, and besides other work composed *The Duke's Motto* for Mr. Charles Fechter, and dramatized some of Miss M. E. Braddon's novels. In 1866 he returned to New York, and after three years of success as an actor opened Brougham's Theatre, in which he had his usual bad luck as a manager. He subsequently made several professional tours through the United States with unabated popularity. After his return to New York from the last in 1877, his fortune having been swept away by the failure of his banker, his friends gave a series of entertainments from which $10,000 were realized, and an annuity purchased for him. He died in New York June 7, 1880. As an actor he excelled in the delineation of Irish characters of all grades from the gentleman to the peasant, and as a dramatist he did much to elevate the tone of the stage in this regard. In his youth he was remarkably handsome, and throughout life he manifested great versatility of talent. His experience as a manager showed, as he said himself, that he had not a spark of business capacity. Besides his numerous original plays, he dramatized successfully some of Dickens's novels, and published some miscellanies under the title of *A Basket of Chips* and *The Bunsby Papers*. He also wrote a fragment of an autobiography, which has been published, with a memoir, by William Winter.

BROWN, Ford Madox, an English painter, was born at Calais, France, in 1821. He is a grandson of Dr. John Brown of Edinburgh, the founder of the Brunonian theory of medicine. He secured his education on the Continent, and his art-studies were made in the schools of France and Belgium. In 1844 and 1845 he contributed cartoons of The Finding of the Body of Harold, Justice, and other subjects to the competitive exhibition in Westminster Hall for the frescoes of the houses of Parliament. Brown, thanks to his continental schooling, was a much better trained artist than almost any of his English professional brethren of that day. Haydon was one of the few to perceive the merits of his designs, and he was generous enough to pronounce cordially in their favor. The designs also excited the warm admiration of Dante Gabriel Rossetti, then a boy of about seventeen years of age. Rossetti, recognizing in Brown's pictures sincerity of purpose and the faculty of penetrating to the heart of a subject, applied to him for instruction. Brown, who had always refused pupils, offered Rossetti the freedom of his studio. Thus began a firm friendship and a close intimacy which lasted until the death of Rossetti. A few years later, when the Pre-Raphaelite Brotherhood was organized under Rossetti's lead for the avowed purpose of bringing English art back to the paths of sincerity and truth, Brown was solicited to connect himself with it, but declined to do so on the ground that he had a dislike for coteries. But the public almost from the first rated Brown as a Pre-Raphaelite, and was justified in doing so, not only by his peculiar selection and treatment of subjects, but by his manner of painting, though he never indulged in the extravagances which marked the performances of some of the reformers themselves. His work was at all times serious, dignified, and really learned, while occasionally it was powerful or profoundly pathetic. Soon after the Westminster Hall competition Brown went to Italy. On his return to England he painted Wycliffe reading his Translation of the Scriptures, which was exhibited in 1848. The year following he exhibited King Lear, and in 1851 Chaucer reciting his Poetry at the Court of Edward III. His Christ washing Peter's Feet was exhibited in 1852. In 1865 he opened in London a special exhibition of his works, composed of about one hundred pieces, half of which were finished pictures and the rest cartoons and sketches. This collection included some of his important performaces, such as The Last of England, Autumn Afternoon, Wilhelmus Conquistator, and a composition entitled Work, upon which he had been engaged for several years. This exhibition found the public better prepared to judge with appreciation than it was at the time of the Westminster Hall competition. Among the more important of Brown's recent works are The Coat of Many Colors, Cordelia's Portion, Elijah and the Widow's Son, Romeo and Juliet, The Entombment, Don Juan, Jacopo Foscari, and Cromwell dictating his Despatch to the Duke of Savoy against the Cruelties to the Vaudois Protestants. For some years Brown has been engaged on the frescoes of the Manchester town-hall illustrating the history of that city. Four are finished, representing The Romans, The Baptism of Eadwin, The Expulsion of the Danes, and The Establishment of the Flemish Weavers by Queen Philippa. Others are to represent Crabtree observing the Transit of Venus and The Edict of the Court-Leet for the Testing of Weights and Measures in 1556. His son, Oliver Madox Brown (1855–1874) was noted for precocity as a painter and author. (W. J. C., JR.)

BROWN, George (1818–1880), a leader of the Reform party in Upper Canada (now Ontario), born in Edinburgh, Scotland, Nov. 29, 1818. He was educated at the High School and Southern Academy in that city. In 1838 he emigrated with his father to New York, where he first became known to the public as publisher of the *British Chronicle*, a journal established by his father in 1842. Visiting Canada in 1843 in the interests of that paper, Mr. Brown made a very favorable impression upon the minds of leading members of the Liberal or Reform party, and, as the result of overtures made him, the publication of the *British Chronicle* was given up, and the *Banner* shortly after established in Toronto. In 1844 the first number of the *Globe* was issued, a paper with which Mr. Brown's name was associated to the last, and which became the chief instrument of his power and one of the most potent factors in Canadian politics. Commencing as a weekly, it became in 1846 a semi-weekly, in 1849 a tri-weekly, and in 1853 a daily. By means of it the young Liberal threw himself with immense energy into the conflicts in which his party was engaged. The years immediately following its establishment were years of constitutional crisis in the Canadas, and his trenchant and powerful articles defended responsible government and representation by population, and opposed whatever savored of State-Churchism.

Mr. Brown was frequently solicited to enter Parliament, and did so in 1851 as member for Kent. He continued to represent this or another constituency until 1867, with an interval of a year or two after 1861. He seems, however, never to have been eager for parliamentary honors, believing he could better serve his party by devoting his whole strength to the *Globe*. Having, in the general election of 1867, been defeated in a chivalrous effort to wrest a doubtful constituency from a very strong Conservative candidate, he declined all the many offers made him of other safe constituencies, and steadily refused all subsequent solicitations to re-enter Parliament. While in Parliament he exerted a marked influence; he was at first tacitly, and then formally, recognized as the leader of the Upper Canadian reformers. This position he continued virtually to hold until his final retirement from the Commons. Most of his public life was spent in opposition. After the general election of 1857, the ministry of the day having been defeated on a test question, the governor-general, Sir Edmund Head, sent for Mr. Brown to form a Cabinet. He did so, but he and his colleagues resigned a day or two after they had taken the oaths of office, in consequence of the refusal of the governor-general to dissolve the House on their advice. Mr. Brown was an ardent promoter of the Confederation, and was induced to enter the Government, though he withdrew when he considered the project safe.

In 1873 he was offered and accepted a seat in the Dominion Senate. In 1874 he went to Washington as plenipotentiary of the Canadian Government to aid Sir Edward Thornton in negotiations for a new treaty of reciprocity. Mr. Brown was cordially received by the Government and public men of the United States, but the draft treaty agreed to by him and his colleague, and by Mr. Fish on behalf of the United States, fell through, in consequence of the refusal of the U. S. Senate to consider it. The valuable paper entitled *Memorandum on the Commercial Relations of the British North American Provinces with the United States* was written by Mr. Brown. In 1875 he declined the position of lieutenant-governor of Ontario.

In 1880 he was shot in the thigh by a former employé of the *Globe* office who had been discharged for neglect of duty. His death, on May 9th, after weeks of lingering, called forth demonstrations of respect and sorrow from people of all classes and all parties. (J. E. W.)

BROWN, Henry Kirke, an American sculptor, was born at Leyden, Mass., in 1814. He for some three years studied painting with Chester Harding, the portrait-painter. While with Harding he had occasion to model a bust, and this experiment inspired such a liking for sculpture that he decided to apply himself mainly to that art. He never, however, entirely relinquished work with the brushes, and is accounted a painter of more than common excellence. Brown studied anatomy in Cincinnati, where he went in 1837, and while in that city he achieved his first marble bust. In 1840 he came East again, and, residing chiefly in Albany and Troy, N. Y., made a great number of busts. He went to Italy in 1840, and remained there four years, during which time he modelled his ideal statues of Daniel, Ruth, Rebecca, David, and so on. Brown's first really important performance, however, was the equestrian statue of Washington in Union Square, New York City. This statue was modelled in Brooklyn, and is a very superior performance. It was cast at the Chicopee foundry, Mass., and is notable for being the first important piece of bronze statuary made in the United States. If the Washington is a success, the bronze statue of Lincoln by Brown, also in Union Square, sins against the first law of sculpture by being out of poise. But, apart from this, the artist has found the ungainly personality of Mr. Lincoln an artistic problem beyond his powers. He has aimed at a certain conventional dignity, but he has achieved anything but a dignified result. The equestrian statue of Gen. Scott, which has been erected on a prominent site at Washington, is treated in a very different manner from the Union Square Washington, and at first glance it is somewhat disappointing on account of a certain suggestion of stiffness in both horse and rider; but it is assuredly one of the very few pieces of sculpture at the national capital which satisfy high artistic requirements. Brown is the maker of another statue of great merit at Washington—that of Gen. Greene in the Hall of Statuary in the Capitol. This is one of the very few fairly sufficient works which that hall up to the present time contains. In 1858, Brown was engaged by the State of South Carolina to make a group for the pediment of the State-House at Columbia. He was employed upon this commission at the time of the breaking out of the Civil War, and when Columbia was burned near the close of the war all of his properties, including several completed statues, were destroyed. This calamity was a severe blow to the artist. He, however, returned to his home in the North, and, applying himself diligently to work, executed a number of commissions, the most important of which have been referred to above. (W. J. C., JR.)

BROWN, JOHN, LL.D. (1810–1882), a Scotch physician and essayist, best known as the author of *Rab and his Friends*, was born at Biggar, in Lanarkshire, Sept. 22, 1810. He was the great-grandson of Rev. John Brown of Haddington, a minister of the Secession Church, who had risen by his own exertions from the humble lot of a shepherd-boy and attained a high reputation for learning. His *Dictionary of the Bible* and other helps to the study of the Scriptures were long held in high esteem. His son, Rev. John Brown of Whitburn, and especially his grandson, Rev. John Brown, D. D., of Edinburgh, followed in the footsteps of the founder of the family, and helped to maintain the scholastic and theological reputation of the Secession (afterwards the United Presbyterian) Church. Rev. Dr. Brown's son, John, turned aside from the usual career of the family to enter the medical profession. He received his education at the High School and University of Edinburgh, where he also pursued his medical studies and received his degree in 1833. For a year he was assistant to a surgeon at Chatham, where his courage and faithfulness during an epidemic of cholera are said to have attracted the notice of Charles Dickens. Settling in Edinburgh, he was abundantly occupied in the practice of his profession, yet some of his leisure he devoted to literature, sketching with the hasty touch of genius humorous and pathetic scenes and characters. In this way *Rab and his Friends* was written when the author was forty-eight years old, and but little known outside the circle of his personal friends. The sketch, taken from his own experience, was read first to a rustic audience, upon whom it fell flat. Immediately upon its publication, however, the power and pathos of the narrative and the homeliness and sympathy of the style gave it general popularity. From the *North British Review*, *Good Words*, and other periodicals Dr. Brown now gathered some of his contributions into a volume under the title *Horæ Subsecivæ* (1858), which has been wittily translated "Brown Studies." More being called for, a second series followed in 1861, while an American edition appeared with the title translated *Spare Hours*. In all of Dr. Brown's writings shrewd observation and practical philosophy are mingled with warm and tender feeling. He was a passionate lover of Nature and humanity, and delighted to portray dogs and children. His sketch of *Marjorie Fleming*, the child-friend of Sir Walter Scott, is his most popular and pathetic piece, except *Rab*. He was also accomplished in art, and his criticisms in that department are considered valuable. In 1874 the University of Edinburgh conferred on him the honorary degree of LL.D., and in 1876 he received a pension of £100 from the civil list. Prior to this his health had failed, and, his mind having suffered from attacks of melancholy, he had ceased to write, but his wants were supplied by generous friends, who placed to his account the sum of £6000. In his last year his former brightness returned, and he revised for publication a third collection of his writings, called *John Leech, and Other Papers* (1882). Scarcely had the volume appeared when his health again failed, and he died of pleurisy, May 11, 1882. As a practising physician he was a friend to his patients, both poor and rich; his kindly heart gave him an insight of sympathy into the dark, sad problems of humanity. His conversation evinced deep thought and earnest sensibility; his wit was keen, but genial. Among his biographical sketches there is none more interesting than that of his father in his *Letter to Rev. Dr. Cairns*. His notice of *Thackeray's Death* is a truly touching obituary. The American edition of his writings in three volumes, under the title *Spare Hours*, does not correspond in arrangement with the Edinburgh edition.

BROWNE, HABLOT KNIGHT (1815–1882), an English book-illustrator and caricaturist, who signed himself "Phiz," was born in 1815. He first came prominently into public notice as the illustrator of *Pickwick Papers* after the death of the artist Seymour, who made the designs for the opening chapters of the work. A disagreement between Dickens and Cruikshank after the publication of *Oliver Twist* led to a re-engagement with Browne, and to his supplying the illustrations for most of the novels written by Dickens during his best period. Cruikshank accused Browne of being an imitator of his style; but there is an appearance of spontaneity about the best designs of Browne which seems to forbid the idea that he was a deliberate imitator of anybody. In the treatment of coarse subjects he goes beyond the coarseness of Cruikshank, and he frequently carries the grotesque into the regions of burlesque. In the handling of serious themes Browne is in every way Cruikshank's inferior. Browne's happiest performances are his representations of the humorous scenes and the humorous characters of Dickens and Lever. The rollicking humor of Lever and the eccentric characterizations of Dickens secured in him a sympathetic interpreter, and his reputation chiefly rests upon the designs which he contributed to the works of these two writers. Browne contributed designs to the Abbotsford edition of Scott's novels, to an illustrated edition of Byron's works, and to many other publications. Most of Browne's best illustrations were made by the aqua-fortis process, which he managed with a skill sufficient for his purposes. Died at Hove, Sussex, July 8, 1882. (W. J. C., JR.)

BROWNELL, HENRY HOWARD (1820–1872), an American lyric poet, was born at Providence, R. I., Feb. 6, 1820. He was the son of Dr. Pardon Brownell, and a nephew of Bishop Brownell. He graduated at Washington (now Trinity) College, Hartford, in 1841, and studied law, but engaged in teaching and authorship. In 1847 he published a volume of poems which was well received. He afterwards composed some popular histories, as *Pioneer Heroes of the New World* and a *History of the War of 1812*. He entered the army in 1861 as a volunteer, and his varied experience brought his true genius to light. He wrote several spirited lyrics, which were collected and published under the title *Lyrics of the Day; or, Newspaper Poetry by a Volunteer in the United States Service*. In 1863 he entered the navy, and served as ensign on Admiral Farragut's staff, and after the war accompanied the admiral to Europe. He resigned in 1868 and returned to Hartford. His last publication was *War Lyrics, and Other Poems*. He died at Hartford, Oct. 31, 1872.

BROWNELL, Thomas Church, D. D., LL.D. (1779–1865), bishop in the Protestant Episcopal Church, was born at Westport, Mass., Oct. 19, 1779. He was educated at Rhode Island College (now Brown University) and Union College, where he graduated in 1804. He continued at Union College after graduation as tutor and professor of belles-lettres and moral philosophy, and in 1809 was chosen professor of chemistry and mineralogy. He visited Europe to procure the necessary apparatus and appliances, and returned after a year's absence. In 1813 he became an Episcopalian, began to study for the ministry, and was ordained by Bishop Hobart, April 11, 1816. He still continued to act as professor in Union College, and performed missionary labors in the country adjoining. In 1818 he became assistant minister in Trinity Church, New York, where he was ordained. He was consecrated bishop of Connecticut, Oct. 27, 1819, and entered vigorously on his work. He was founder of Washington (now Trinity) College, Hartford, and its first president from 1824 to 1831. On the death of Bishop Chase of Illinois in 1852 he became presiding bishop. He died at Hartford, Conn., Jan. 13, 1865. He wrote *The Family Prayer Book*, a complete commentary on the service of the Episcopal Church, and also compiled several volumes of extracts on devotional and practical piety under the title of *Religion of the Heart and Life*.

BROWNING, Robert, an English poet, was born at Camberwell, a suburb at the south of London, on May 7, 1812. His father was a clerk in the Bank of England and a dissenter. When only eight years old the boy made humorous translations in verse from Horace, and four years later was trying in vain to find a publisher for some poems that were remarkable only for their Byronic fervor. His enthusiasm for Byron soon waned before the influence of Keats and Shelley, with whose works he first became acquainted in 1825. During all this time he had been attending a day-school at Peckham; in his fourteenth year he began to study with a tutor, and then entered the former London University (now University College), but did not remain to take a degree. Browning's father, who never learned to take unmixed delight in his poems, had yet been greatly impressed by his powers of mind, and now left to his discretion the entire direction of his future life and relieved him from any necessity of choosing a profession. For some time young Browning was occupied with poetical plans, noticeably with one for a series of epics illustrating the "life of typical souls," but without any immediate result. In 1832 he wrote *Pauline*, a strained and immature poem that, with some autobiographical touches, described the progress of a philosophic life; it was published anonymously in 1833, and not included among his authorized works till 1868. In 1834, Mr. Browning travelled for the greater part of a year on the continent of Europe, making a stay of some months at St. Petersburg, and lingering long in Italy, where his explorations in the monastic libraries of Lombardy and Venice furnished him with the intimate knowledge of mediæval thought and history that appears in *Sordello* and "The Bishop Orders his Tomb at St. Praxed's Church." His peculiar genius was first shown in this year in two lyrics contributed to Fox's *Monthly Repository* under the title of "Madhouse Cells," and now reprinted in *Dramatic Lyrics* with the sub-titles "Johannes Agricola in Meditation" and "Porphyria's Lover." In "Porphyria's Lover" is found that intensely vivid description, in the form of a semi-dramatic soliloquy, of intellectual or emotional perversion, that Mr. Browning so often attempted, but never with more perfect performance. In the winter of 1834, in London, *Paracelsus* was written, and in the following year published. An accidental acquaintance with Macready the actor led to the writing of *Strafford*, which was produced with considerable success in May, 1837, at Covent Garden Theatre by Macready, supported by Vandenhoff and Helen Faucit. During the three years following, *Pippa Passes*, *King Victor and King Charles*, *The Return of the Druses* (which was at first called *Mansour, the Hierophant*), and *Sordello* were composed, and in 1840 *Sordello* was published. Between 1841 and 1846 the series known as *Bells and Pomegranates* appeared in a cheap pamphlet form in eight numbers, beginning with *Pippa Passes* and ending with *Luria* and *A Soul's Tragedy*. Of Mr. Browning's plays, *The Blot on the 'Scutcheon* was acted in 1843 at Drury Lane Theatre, and *Colombe's Birthday*, with Miss Faucit in the leading part, in 1853, at the Haymarket.

Sept. 12, 1846, Mr. Browning, after a romantic courtship, married Elizabeth Barrett Barrett, against the wishes of her father. The two poets went immediately to Italy, and, with occasional visits for health to Pisa, made their home at Florence in the Casa Guidi palace, that Mrs. Browning's poem has made a household word. In 1849 the first collected edition of Mr. Browning's poems was published in London and in Boston, and in the next year, in London, *Christmas-Eve and Easter-Day*. In 1852 he wrote for Mr. Moxon the publisher an enthusiastic introductory essay to a collection of Shelley's letters, but suppressed it on the discovery by Mr. F. T. Palgrave that the letters were spurious. *Men and Women*, in 1855, was the only other production of Mr. Browning during his stay of fifteen years in Italy, but the poet's brain was not idle, and many of the Italian scenes of *The Ring and the Book* must have been already taking definite form. In 1859 and 1860, Mr. Browning took friendly charge of Walter Savage Landor, then in the decline of his splendid powers. In 1861, Mrs. Browning died, and her husband returned to England.

Dramatis Personæ was published in 1864. In 1867, Mr. Browning was created an honorary M.A. of Oxford, and elected to an honorary fellowship at Balliol College. In 1868–69, *The Ring and the Book* came out in two successive volumes, and was by many critics accepted as a masterpiece. Since then Mr. Browning has published *Balaustion's Adventure: including a Transcript from Euripides*, and *Prince Hohenstiel-Schwangau, Savior of Society* (1871); *Fifine at the Fair* (1872); *Red Cotton Night-Cap Country* (1873); *Aristophanes' Apology* (1875); *The Inn-Album; Pacchiarotto, or How he Worked in Distemper* (1876); *The Agamemnon of Æschylus* (1877); *La Saisiaz: The Two Poets of Croisic* (1878); *Dramatic Idyls* (1879); *Dramatic Idyls, Second Series* (1880); and *Jocoseria* (1883).

Mr. Browning's early poems, *Pauline*, *Paracelsus*, and *Sordello*, show that he belongs to the romantic period. He is the successor of Shelley and Byron in continuing "the battle of will against the social forces of a dozen centuries," for this was the meaning of the whole Romantic movement, and not merely of the French Revolution. The aim of generations had been to civilize human nature by making it orderly and conventional; now, natural impulses, passions, and force of character were regarded as something divine. The poets of the so-called "Spasmodic School," with whom Mr. Browning must be classed, carried on the work of the Revolutionary poets by elevating the eccentricity of genius above literary canons, and by substituting the independent authority of the individual will for the conception of social obligation. The egotism of the speaker in *Pauline*, of Paracelsus, of Festus in Mr. Bailey's poem, of Walter in Alexander Smith's *Life-Drama*, and of Sydney Dobell's Balder, is only another form of the egotism of the Byronic Corsair, with his longing for "life unconditioned" transferred from the world of action to that of thought, and their aspiration for infinite love or superhuman knowledge is only a more dramatic presentment of Shelley's visionary ideals. Mr. Browning's juvenile design of representing in a series of monodramatic epics "the life of typical souls" describes with precision the aim of all the writers of this school. Their heroes are all philosophers or poets endowed by hypothesis with transcendent genius, and manifesting a self-confidence and self-consciousness scarcely less extraordinary; indeed, of each author it was suggested that his hero was only a colossal shadow of himself. These poets, like Carlyle, who was inspired by the same influences, were rather inclined to adopt the attitude of seers and a symbolical and elliptical style, with some contempt of the critics, who found it hard to comprehend. Mr. Browning's attitude towards his critics is shown with great definiteness in *Pacchiarotto*. At this time Mr. Browning was far from being realistic: in *Paracelsus* the historical facts are confessedly distorted, and in *Sordello* his Italian travels and studies produced nothing but a background of confused history and a few lines of splendid description of Verona and the Mincio; as in *Festus* or *A Life-Drama*, there is no plot, no variety of characters, but everything is subordinated to the development of the typical soul. In *Paracelsus* the hero's endeavor to attain infinite wisdom is supplemented by the longing for love of the Shelley-like poet Aprile, and in *Sordello* a perfected Paracelsus, "with conscious power and not mere aspiration," is placed before the practical duties of a reformer of society. These heroes both die with their hopes unfulfilled, but each is called by Mr. Browning successful—Paracelsus, because he came to see that knowledge without love is vain; and Sordello, because he died at the moment of conquering the temptation to combine his vast designs for human happiness with the selfish purposes of a faction. The keynote to these poems is struck by a line in *Red Cotton Night-Cap Country:* "Success is naught, endeavor's all." Though its vagueness and lack of proportion were criticised as immature, *Paracelsus* had, by its many beautiful similes and one fine lyric, excited great hopes of Mr. Browning's future performances, but these hopes were disappointed by *Sordello*, which was a hieroglyphic to the world of letters, and remains unintelligible to the many, though studied by a few with untiring and reverent curiosity. It may be said, perhaps, to be in poetry very much what *Sartor Resartus* is in prose.

Some trace of romanticism reappears in all Mr. Browning work, leading to a choice of improbable situations, as in a *Blot on the 'Scutcheon*, and to improbable explanations of conduct, as in *The Ring and the Book*. It distinguishes his ethical position from that of George Eliot, with which it has many points of contact. Both authors are impressed by the purifying power and spiritual necessity of emotion and high intellectual ideals. Mr. Browning reminds us of George Eliot when he shows how the poor gypsy hag in the "Flight of the Duchess" is herself made great by the greatness of her human sympathy, or how the unsuspected sweetness of Caponsacchi's character in *The Ring and the Book* is drawn out by his mighty though unpriestlike passion. But George Eliot insists on the importance of ethical duties imposed by natural laws, by the necessities of race, or created by contact with other people, while Mr. Browning, like Shelley, makes human progress depend chiefly on man's endeavors towards unattainable ideals and on his moments of intense feeling.

What distinguishes Mr. Browning's work from that of other poets is its intellectual quality. His emotions and imagination are dominated by a subtle, nimble, analyzing intelligence. No poet since Dryden has reasoned so well in verse. In *Christmas-Eve and Easter-Day* a long metaphysical argument is perfectly presented; in *The Ring and the Book* Pompilia's innocence is defended with the power of an Erskine or a Choate. He delights in making a keen, clever man support a paradoxical or untenable position with plausible casuistry, as in Djubal in *The Return of the Druses*, in "Bishop Blougram's Apology," "Mr. Sludge the Medium," and *Prince Hohenstiel-Schwangau*, where a singular argument is made for the Italian policy of Napoleon III. These various apologetic poems are illustrations of Mr. Browning's theory that a man's character is determined as much by what he thinks he is or pretends to be as by what he actually does—a corollary of the moral of the early poems: "Success is naught, endeavor's all." Mr. Browning has a wonderful faculty of perceiving at once, and usually without emotion, all the possible motives that lead to action; he is impressed by the complexity of modern character, and is contented to describe it without deciding on questions of morality: when he does give judgment, as in *Iván Ivánovitch* or in *The Ring and the Book*, there are always sufficient reasons given for a dissenting opinion. This extraordinary intellectual activity and suggestiveness often leads Mr. Browning to impute the motives of a clever man of the present day to the simpler characters of antiquity or of the Middle Ages. In translating the "Alcestis," in *Balaustion's Adventure*, he inserts a most unhellenic defence of Admetus. Even little Pippa becomes at times somewhat metaphysical. Luria speaks in Mr. Browning's phrases, not in his own: Othello observed better the possible limits of the Moorish intellect.

Mr. Browning's dramatic power is, consequently, most frequently shown in a vivid perception of a tragical situation that is described in a semi-dramatic monologue, as in many of the *Dramatic Idyls* and in the short expressions of individual character that form the greater number of the *Lyrics*. But in the great tragedies, *The Return of the Druses* and *King Victor and King Charles;* in that brilliant comedy, *Colombe's Birthday;* in the wonderful lyrical drama, *Pippa Passes;* and in the three scenes of *In a Balcony*,—dramatic art almost reaches perfection. In these plays there is an harmonious development of the plot that is rare in modern work. The impressiveness of the tragic catastrophe in *The Return of the Druses* and in *Luria* recalls the stern intensity of the Elizabethan dramatists. Mr. Browning is naturally a great dramatic poet who has fallen upon an undramatic age, and the modern spirit has reacted upon him by stimulating the intellectual and humorous sides of his nature and repressing his imagination. The change that has taken place in prose literature during the last fifty years is reflected in Mr. Browning's poems. Romantic interest in the individual has been succeeded by a scientific observation of the complex relations of different characters. Such a poem as *A Soul's Tragedy* or *The Ring and the Book* is the counterpart of the psychological novel, and for this method of representing life a purely lyrical or dramatic form is inadequate. When Mr. Browning began to write, the novel had not yet been fashioned into the flexible instrument of expression it has become in the hands of George Eliot, and his later works, *Fifine*, *The Inn Album*, *The Ring and the Book*, *Red Cotton Night-Cap Country*, show by their uncouthness the attempt of a powerful mind, overburdened with thought, to say in verse what a later writer of similar genius must say in prose.

Though most of Mr. Browning's lyrics are semi-dramatic, and primarily intellectual conceptions of character cast into a lyrical form, there are few songs more stirring than his "Cavalier Tunes," or more full of clear and rippling music than the songs of Pippa, or than "Home Thoughts from Abroad" or "Misconceptions." One must turn to *Romeo and Juliet* to find a more melodious expression of pure and passionate love than "In a Gondola." The love-songs of few other poets pierce the heart with more unerring certainty; they have an unrelenting sweetness that the world has not heard since Shelley and Landor died; but it is only at times, in "The Lost Mistress," "A Woman's Last Word," and in the poems written to his wife, "By the Fireside" and "One Word More," that this harsh voice becomes tender.

It may have been the romantic taste of the time that first induced Mr. Browning to select his subjects from the history of the Middle Ages. But a breadth of vision distinguishes his mediæval studies from those of the so-called pre-Raphaelite poets: it is character rather than its environment that he describes, and in character what is not merely accidental or temporary. The mediævalism of the early poems served simply as a background for a Paracelsus or a Sordello, and in *The Ring and the Book*, though the Italy of the time is painted with minute accuracy, there is the element of universality that appears in *Romola*. In many of his recent works not even the setting of the poems is taken from the past. Of the translations from the Greek it is enough to say that the "Transcript from Euripides" in *Balaustion's Adventure* is, with the exception of some attempts at modernization, a most poetical and accurate reproduction of the *Alcestis;* that the translation of the *Hercules Furens* in *Aristophanes' Apology* has less merit, though it is less of a paraphrase; while in *The Agamemnon* the most notable thing is the extreme skill with which every obscurity in the original has been retained.

Mr. Browning's style is usually defined as "difficult" and "obscure." A comparison of *Pippa Passes* with the *Two Poets of Croisic*, or of *Balaustion's Adventure* with *Aristophanes' Apology*, show that it is when Mr. Browning's intellect, instead of his emotion or imagination, is directing his pen that his style becomes difficult and the rhymes harsh: then all the possible arguments and illustrations seem to occur to him at once, and he transfers them to his paper with lightning rapidity, apparently with all the associations, half-guesses, and mental processes that accompanied their first conception. Mr. Browning is said to have confessed that he was weary of the conventional set of symbols and tried to use new ones. It is certain that his style indicates a reaction against the school of Keats, and that the existence of a modern school of poets who too often sacrifice sense to sound is partly accountable for the grotesque extravagances of "Pietro of Abano" and *Pacchiarotto*. Mr. Browning has always taught that poetry depends on the thought and not on the expression. and he has chosen his words accordingly, without regard to their beauty or vulgarity. In "The Englishman in Italy" the effect of this tendency is seen in the extreme freshness and accuracy of his descriptions. No writer has ever used single words with greater effect or condensed as comprehensive meaning in so few. To a student Mr. Browning is perhaps never unintelligible; when read aloud even "Halbert and Hob" becomes clear; and that he can speak, when he chooses, to the people in their own language is proved by the popularity of his ballads, "The Pied Piper of Hamelin" and "Hervé Riel." (G. P.)

BROWNLOW, William Gannaway (1805–1877), a Methodist preacher, journalist, and politician, was born in Wythe co., Va., Aug. 29, 1805. He was left an orphan at an early age, and learnt the carpenter's trade. In 1826 he entered the Methodist ministry, and was an itinerant preacher for ten years. He also took part in politics, advocating the re-election of John Quincy Adams to the Presidency in 1828. At a later period, in South Carolina, he openly opposed the nullification scheme, and when denounced by his opponents published a pamphlet in defence of his course. In 1837 he began to edit the *Knoxville Whig*, in connection with which he became noted for his violent and unscrupulous denunciation of his political opponents, and acquired the sobriquet of "the fighting parson." Rev. J. R. Graves, editor of the *Tennessee Baptist*, published in 1856 a severe attack on the Methodist Episcopal Church under the title *The Great Iron Wheel; or, Republicanism Backwards and Christianity Reversed*. Mr. Brownlow published a reply called *The Iron Wheel Examined, and its False Spokes Extracted*. In 1858 he visited the North, and held a public discussion in Philadelphia with Rev. A. Pryne of New York, maintaining the expediency and divine right of slavery. When the secession of the Southern States was agitated, he opposed it with characteristic vehemence, on the ground that slavery would be thus overthrown. When the ordinance of secession was passed in Tennessee, he was obliged to suspend the publication of his paper, Oct. 24, 1861, and take refuge in the mountains. After remaining some time in concealment, having received word that a passport would be given him to leave for the North, he returned to Knoxville, where he was arrested, Dec. 6, 1861, on a charge of treason to the Confederacy, and imprisoned until the following March. He was then sent within the Union lines at Nashville, and his family were afterwards driven from their home. He made a tour through the North, delivering addresses in the principal cities, and also published *Sketches of the Rise, Progress, and Decline of Secession, with a Narrative of Personal Adventures among the Rebels*, which had an immense circulation. This volume was generally called "Parson Brownlow's Book," and its thrilling narratives of the sufferings of the Union men of East Tennessee, as well as his fierce denunciations of Southern leaders, did much to excite popular indignation in the North. In 1864 he returned to Tennessee, re-established his paper, and was elected governor of the State. In 1869 he was elected United States Senator. He died at Knoxville, Tenn., April 29, 1877.

BROWNSON, Orestes Augustus, LL.D. (1803–1876), an American philosopher and theologian, was born at Stockbridge, Vt., Sept. 16, 1803. While a scholar at an academy at Ballston, N. Y., he joined the Presbyterian Church, but afterwards changed his views, and in 1825 became an advocate of Universalism. Having formed the acquaintance of Robert Owen and adopted his ideas of socialism, Brownson tried to form in New York a workingmen's party. Then falling under the influence of Rev. Dr. Channing, he became a Unitarian, and was for a time pastor of a congregation. In 1836 he formed in Boston a "Society for Christian Union and Progress," and published his *New Views of Christianity, Society, and Church*. In 1838 he established the *Boston Quarterly Review*, in which he was almost the sole writer. He did not profess to support any particular system or creed, but to prepare the way for great and radical changes in existing systems. In 1840 he published *Charles Elwood; or, The Infidel Converted*, which was a philosophical essay in the form of a novel. In 1843 he abandoned preaching and merged his *Review* in the *Democratic Review* of New York, to which he engaged to contribute, but his articles were too philosophical for his new readers, and the engagement terminated in a year. In 1844 he became a Roman Catholic, and thereafter remained a layman in that faith. He now commenced the publication of *Brownson's Quarterly Review*, in which he especially defended the doctrines and practices of the Roman Catholic Church, but also discussed literary, social, and political questions. In 1855 he removed to New York City. During the war the publication of his *Review* was suspended, but it was resumed in 1873 and continued till his death. He was invited by Dr. Newman and others to a professorship in the Catholic University in Dublin, but he declined the offer. He died at Detroit, Mich., April 17, 1876. Besides the *Review*, which was written almost exclusively by himself, he published *The Spirit-Rapper*, 1854; *The Convert; or, Leaves from my Experience*, 1857; *The American Republic, an Examination of its Constitution, Tendencies, and Destiny*, 1865; and *Conversation on Liberalism and the Church*, 1869

BROWN-SÉQUARD, ÉDOUARD, an eminent French physiologist, was born in the island of Mauritius in 1818. He was a son of Edward Brown (a native of Philadelphia, U. S.) and a French lady named Séquard. He studied medicine in Paris, where he graduated as M. D. in 1840. He gained distinction by his experiments and researches in physiology, especially on the composition of the blood, animal heat, the spinal cord, the muscular system, and the sympathetic nerves, and made important discoveries in pathological anatomy. He received several prizes of the French Institute for his contributions to science. He was a professor in the medical department of Harvard University 1864–68. In Jan., 1869, he was appointed professor in the School of Medicine in Paris. He delivered several courses of lectures in England and the United States. In 1873 he established a medical journal in New York. In August, 1878, he succeeded Claude Bernard as professor of medicine in the College of France. He was for many years prominent as a conductor of medical journals, and in these most of his principal scientific papers (which are very numerous) have been published. Among his works are *Lectures on Functional Nervous Affections* (New York, 1873) and *Lectures on Paralysis* (New York, 1872).

BROWNSVILLE, a port of entry and the county-seat of Cameron co., Texas, is on the E. bank of the Rio Grande, 28 miles from its mouth, and nearly opposite Matamoros in Mexico. It is connected with Point Isabel, 22 miles distant, by the Rio Grande Railroad. There is also a line of steamboats plying to Roma, the head of navigation on the Rio Grande. It is supported principally by the trade with Mexico, *viâ* Brazos, and the traffic of Matamoros (amounting in 1881 to $3,937,917) passes through it. It has a college, an efficient system of public schools, a U. S. custom-house, three churches, a convent, a daily and a weekly paper, a theatre, and an ice-factory. Directly south of it is the military post of Fort Brown, with fine barracks. Near the site of the present city during the Mexican War in 1846 the battles of Palo Alto and Resaca de la Palma were fought. At the time Gen. Taylor's army marched to the Rio Grande this place was occupied with corn-fields, but the town sprung up rapidly during the military occupation of the frontier, and was incorporated as a city in 1848. During the Civil War, Brownsville did a large business in cotton and merchandise, and near the town was fought the last battle by the Southern Confederacy. Three-fourths of the inhabitants are Mexicans, and most of the rest are of various European nationalities. In 1880 the population numbered 4938, but it has since increased to over 6000.

BROWN UNIVERSITY, in the city of Providence, in the State of Rhode Island, the oldest and most amply endowed institution of learning connected with the Baptist denomination in the United States, was founded in 1764. It owes its origin to the efforts of leading members of the Philadelphia Association, under whose auspices "Hopewell Academy" in New Jersey was at first established, in order to secure for their rapidly multiplying churches an educated ministry. The college was commenced in Warren, an inland town ten miles from Providence, but after six years it was removed to its present location. The story of its early struggles and difficulties is told at length in the *Life, Times, and Correspondence of James Manning*, its first president. During the war of the Revolution college studies were suspended, and the building now called University Hall was used for barracks, and afterwards for a hospital, by the American and French troops. For more than forty years it was called Rhode Island College, but in 1804 it received the name of Brown University, in honor of Nicholas Brown, a leading merchant of Providence, who was its chief benefactor.

The charter, which was granted by the General Assembly of Rhode Island in February, 1764, has long been regarded as one of the best college charters in New England, securing ample privileges by its several clear and explicit provisions, and recognizing throughout the principles of civil and religious freedom. By it the corporation is made to consist of two branches—namely, that of the trustees and that of the fellows, "with distinct, separate, and respective powers." The trustees are thirty-six in number, of whom twenty-two must be Baptists or anti-Pedobaptists, five Quakers or Friends, five Episcopalians, and four Congregationalists. Since 1874 vacancies in this board have been filled from nominations made by the ballots of the alumni. The number of the fellows, including the president—who, in the language of the charter, "must always be a fellow"—is twelve, of whom eight "are for ever to be elected of the denomination called Baptists or anti-Pedobaptists, and the rest indifferently of any or all denominations." The president must "for ever be of the denomination called Baptists."

The buildings are ten in number. Of these, the oldest, University Hall, has an historic interest, having been modelled after Nassau Hall in Princeton, where President Manning and Tutor Howell, the first instructors, were graduated. The corner-stone of the foundation-walls was laid in May, 1770, by John Brown, the famous leader in the destruction of the Gaspee two years later. This venerable structure is soon to be thoroughly renovated, the sum of thirty thousand dollars having been subscribed for this purpose. The "Grammar School" building, now rented to private parties and occupied, as at first, for a preparatory school, was erected in 1810, the cost having been defrayed by subscription. Hope College was erected in 1822 at the expense of Hon. Nicholas Brown, who named it after his only surviving sister, Hope Ives, wife of the late Thomas P. Ives. Manning Hall was erected in 1834, also at the expense of Mr. Brown, who named it after his revered instructor, the first president. Rhode Island Hall and the president's mansion were erected in 1840 at the expense mostly of citizens of Providence, Mr. Brown contributing $10,000. The chemical laboratory was erected in 1862 through the exertions of Hon. Nathaniel P. Hill, United States Senator from Colorado, who was then a professor in the institution. The new library building, which has been pronounced by competent judges to be one of the finest of its kind in the country, was erected in 1878, at a cost, exclusive of the lot on which it stands, of $96,000. Both building and grounds were a bequest of the late John Carter Brown, a son of the benefactor from whom the institution derives its name. The new dormitory, named Slater Hall, was erected in 1879 by Hon. Horatio N. Slater, a member of the board of fellows and a liberal benefactor of the college. Sayles Memorial Hall, which was dedicated in June, 1881, is a beautiful structure of granite and freestone.

The library contains at present 55,000 bound volumes and upwards of 15,000 unbound pamphlets, being the third college library in size and value in the country. The funds of the university, according to the latest report of the treasurer, amount to $877,028. Of this sum, $175,628 are unproductive, having been given for the erection of new buildings, etc., leaving a working capital of $701,400. There are sixty-six scholarships, of $1000 each, for the aid of indigent students, and also premium, prize, and aid funds amounting in addition to $38,762.

The first president, James Manning, died in 1791. His successors were Jonathan Maxcy, Asa Messer, Francis Wayland, Barnas Sears, and Alexis Caswell, all of whom have died. The present head of the university is Ezekiel G. Robinson, who entered upon his duties in the fall of 1872. The faculty consists of the president, thirteen professors, two assistant professors, one instructor, and one assistant instructor. These, together with one librarian, one assistant librarian, and a registrar, complete the college staff of officers. The present number of students is 281.

The number of graduates, according to the latest triennial catalogue, is 3028. About one-fourth of these have been ordained to the Christian ministry. (R. A. G.)

BRUCE, ALEXANDER BALMAIN, D.D., a Scotch professor and minister of the Free Church, was born in Aberdalgie, Perthshire, in 1831. He was educated in the University of Edinburgh, and received his theological training in the Free Church College, Edinburgh, under Dr. William Cunningham. In 1859 he took his first pastoral charge in Cardross, on the north bank of the Clyde, where he remained nine years. In 1868 he was transferred to a charge in Broughty Ferry, near Dundee, and in 1875 he was appointed professor of apologetics and New-Testament exegesis in the Free Church College, Glasgow, which position he still occupies. He received the honorary degree of D.D. from the University of Glasgow in 1876. He is the author of several well-known works, the first being *The Training of the Twelve* (1871; 3d ed. 1882). The next was *The Humiliation of Christ* (1876; 2d ed. 1881). His work on *The Chief End of Revelation* (London, 1876) was the substance of a series of lectures delivered in the Presbyterian College, London, and on its appearance provoked some hostile criticism. His latest work is on *The Parabolic Teaching of Christ* (London, 1882).

BRUCH, MAX, the celebrated musical composer, who was born at Cologne, Jan. 6. 1838, probably received his earliest musical promptings from his mother, who was considered a fine singer. Having studied with Breidenstein at Bonn, he gained the scholarship of the Mozart foundation at Frankfort-on-Main, which lasted from 1852 to 1856, during which period he studied with Hiller, Reinecke, and Breuning at Cologne. After visiting Leipsic, Bruch proceeded to Munich, where he was introduced to the poet Geibel, who wrote the libretto of *Loreley* for Mendelssohn. Bruch had already composed music for this work, and, having obtained Geibel's consent, it was produced at Mannheim. Since 1870, Bruch has devoted himself entirely to composition, residing at Berlin and Bonn. His earliest work was an operetta, *Scherz, List, und Rache* (Goethe). Then followed some chamber music and the *Loreley* (op. 16).

The opus 23, *Scenes from the Frithjof-Saga*, set for male voices and orchestra, made the composer at once famous. The *Odysseus* was also received with great favor. The opera *Hermione* (founded on Shakespeare's *Winter's Tale*) was not so successful. In December. 1875, Bruch produced the oratorio *Arminius*, and subsequently incidental music for Schiller's *Jeanne d'Arc*. Perhaps of all these larger works the *Scenes from the Odysseus* best displays the special good qualities of the composer. He herein shows the power of being able to provide sufficient musical subject-matter as to be thoroughly interesting to each singer and orchestral performer engaged in its rendition. He treats the orchestra in the most masterly way, and contrasts its varied tones with those of men-singers alone and women-singers alone, or the different divisions of the choral body in combination and dramatic opposition. (S. A. P.)

BRUGSCH, HENRY CHARLES (known as BRUGSCH BEY), a German Egyptologist, born at Berlin, Feb. 18, 1827. While yet a student, in 1848, he wrote a Latin treatise on the demotic inscriptions of Egypt, and soon attracted the favorable notice of Alexander von Humboldt, and, through him, of the king, Frederick William IV. He was sent at the government expense to study the Egyptian monuments in Europe, chiefly in Paris, London, Turin, and Leyden, and in 1853 he went for the first time to Egypt, where he joined the learned Mariette in his researches and discoveries. The reputation thus acquired led to his appointment in 1854 as special professor and curator of the Egyptian Museum at Berlin. In 1860 he was attached to the embassy of the Baron Minutoli to Persia, and travelled extensively in that country. Upon the death of the ambassador he was in charge of the mission, and at a later day he wrote an account of his travels, entitled *Journey of the Prussian Embassy to Persia* (2 vols. 1862–63). To continue his studies, he accepted in 1864 the post of Prussian consul at Cairo, from which he was recalled in 1868 to take the chair of Egyptian antiquities at the University of Göttingen. While holding this position he was invited by the viceroy of Egypt to take charge of the school of Egyptology at Cairo. It was while in this post that he was sent as commissioner to several international expositions with the rank and title of bey, so that he is usually called Brugsch Bey. He has written several works in his own department which are considered of great value. Among them the principal are—*Demotic Grammar* (1855); *New Researches concerning the Division of the Year among the Ancient Egyptians* (1856); *Egyptian Monuments* (1862–6); *History of Egypt from the Earliest Times to the Present Day* (Vol. I. 1859; 2d ed. 1875); *Geographic Inscriptions on Ancient Egyptian Monuments* (1865–6); *A Dictionary of Hieroglyphics* (1867–8); *The Exodus and the Egyptian Monuments* (1875); *New Fragments of the Codex Sinaiticus* (1875). He has also established a *Journal of the Egyptian Language and Antiquities* (1864 *et seq.*) (H. C.)

BRUNSWICK, the county-seat of Glynn co., Ga., is on St. Simon's Sound, an inlet of the Atlantic Ocean, about 75 miles S. of Savannah. It is a port of entry, and the terminus of the Brunswick and Albany Railroad and the Brunswick and Macon Railroad. These roads cross a pine-forest belt 140 miles wide, which furnishes an immense quantity of yellow-pine lumber and naval stores for exportation. Brunswick has a large hotel, four churches for whites and three for colored people, and good public schools. Gen. Oglethorpe, the founder of Georgia, had a garrison here and laid out the town in 1735, and here John Wesley and George Whitefield preached under an oak which is still standing. The town had no commercial importance until 1860; the annual exports amount to $2,500,000. Population, 2891.

BRUTÉ, SIMON GABRIEL (1779–1839), bishop of Vincennes, Ind., was born at Rennes, France, March 20, 1779. His father was superintendent of the royal domains in Brittany. Bruté's intention was to enter the ecclesiastical state, but the French Revolution had closed the way to this career. In 1796 he began the study of medicine at Rennes, and continued it in Paris, where he graduated, taking the first prize out of eleven hundred students. Almost immediately after receiving his diploma he entered the seminary of St. Sulpice at Paris, and commenced the study of theology, Napoleon having just re-established the Church in France. He devoted himself with even more ardor to his new studies than he had bestowed upon medicine; was ordained priest in 1808, and refused the offer of an assistant chaplaincy to the emperor, with the dignity of canon of the cathedral of Rennes, to become professor of theology in the seminary. After two years in this position he joined Bishop Flaget, who was at that time in France looking for priests for the American mission, and in the summer of 1810 he sailed from Bordeaux with the bishop, arriving at Baltimore on August 10. Here he spent two years teaching philosophy at St. Mary's College. In 1812 he was sent to Emmittsburg, and labored there with great zeal and success. In Nov., 1815, he was made president of St. Mary's College, Baltimore, a position which he adorned by his virtue and learning until 1817, when he was recalled to Emmittsburg. Here he was pastor of the church, lecturer on the sacred Scriptures, and professor of theology in the ecclesiastical seminary and of natural philosophy in Mt. St. Mary's College.

M. Bruté's profound learning caused him to be often chosen theologian by different prelates in the Church's councils. The second provincial council of Baltimore met in Oct., 1833, and one of the first acts of the assembled bishops was to request the erection of a new episcopal see at Vincennes, Ind., and to recommend M. Bruté to be its first bishop. The pope having so directed, he took possession of his diocese on the 5th of November, 1824. The new see embraced the whole of Indiana and the greater part of Illinois. His episcopal palace was one small room with a little closet, the whole 12 × 25 feet, with neither garret nor cellar, and the bishop's income was $250, derived from subscriptions. In the whole diocese there was neither seminary, college, nor parish school. His first step was to open a school at Vincennes; he then commenced the visitation of his vast diocese, in which undertaking he travelled on horseback and endured every privation and discomfort. To secure money and clergymen, he made a journey to France not long after his consecration, and brought back twenty priests and seminarians, and means sufficient to establish a diocesan seminary at Vincennes, an orphan asylum, and a free school, and to complete his cathedral and build small churches throughout the diocese. Although his episcopacy lasted less than five years, he built 23 churches and 28 stations, 1 theological seminary, 1 secular college, 1 female academy, 2 free schools, founded 2 religious communities, and increased the number of priests from 3 to 24. He died June 26, 1839. (E. L. D.)

BRYAN, the county-seat of Williams co., Ohio, is 54 miles W. of Toledo, on the Lake Shore and Michigan Southern Railroad. It has a court-house, two national banks, three hotels, two weekly newspapers, six churches, and a union school. It has three saw-mills, two flour-mills, a planing-mill, a foundry and machine-shop, and manufactures of boots, shoes, carriages, wheelbarrows, furniture, barrels, and cheese. It was settled in 1840, and has numerous flowing wells, which are made by boring from 60 to 100 feet. It is surrounded by a fine farming and dairy country. Population, of various origin, 2952.

BRYAN, the county-seat of Brazos co., Texas, is 150 miles N. of Galveston and 8 miles E. of Brazos River, on the Houston and Texas Central Railroad. It has a fine court-house, two weekly newspapers, two banks, six churches, a commodious free-school building and good private schools, and is the seat of the Agricultural and Mechanical College of Texas. It has a large establishment for the manufacture of cotton-gins, a chair-factory, carriage-factory, saw-mill, and other industrial works. It is on a high prairie in a fine agricultural and stock-raising district, and its trade amounts to $1,250,000 annually.

BRYANT, William Cullen (1794–1878), an American poet and journalist, and one of the foremost figures in the literary history of the country, was born Nov. 3, 1794, at Cummington, Hampshire co., Mass., a beautiful hilly country, fit cradle and home for a poet. The town was founded but a few years before by poor but enterprising settlers from Concord, who brought with them many of the severest tenets of the Puritans. Through his mother, Sarah Snell, an energetic and thrifty woman, he traced his ancestry to John Alden and Priscilla Mullins, whose story has been so beautifully told in the verses of another of their descendants, the poet Longfellow. His father, Dr. Peter Bryant, was a country physician, who came of a long-lived family, many of them doctors, going back to Stephen Bryant, who arrived in America in 1632. Dr. Bryant was a man of quiet and reserved temperament, a keen observer of Nature, and a lover of the classic poets of England, who himself was addicted to the making of verses, and impressed his tastes upon the minds of his children. The long winter nights of the region in which they lived were devoted to the treasures of the doctor's library, the largest of the neighborhood, and the days to attendance upon the public school and the exploration of the surrounding country. It was their habit to declaim to the woods and fields the verses they had read—an exercise in which Cullen, the second of the sons, and the more delicate and sensitive of them, took the greatest interest. He often tried his own "rude numbers" on these occasions, so that from a very early age he became a maker of verses. There are still extant a great many poems and poetical fragments which he wrote between his eighth and his sixteenth year—odes, satires, paraphrases of the Bible, and more ambitious compositions. One of them, treating of the advances of knowledge, he delivered before his school in his eleventh year, and it was published in 1807 in the county newspaper, the *Hampshire Gazette*. In his thirteenth year Dr. Bryant found him engaged in a lampoon upon President Jefferson, whose retaliatory measures against the English declaration of a continental blockade were exceedingly unpopular in New England, and he encouraged him to go on with it through several hundred lines. It was published in Boston in 1807 under title of "*The Embargo: a Satire*, by a Youth of Thirteen." The *Monthly Anthology*, then a critical authority, expressed a doubt as to the ability of a boy of thirteen to write such verses, and when, therefore, a second edition appeared in the following year (1808), including the "Spanish Revolution" and other poems, an advertisement was prefixed to it reasserting the age of the poet, "which," it said, "can be authenticated by many inhabitants of that place [Cummington]." These juvenile productions, for the most part imitations of the style of Pope, who was then immensely admired, although they showed no great poetic susceptibility, were yet evidences of a pretty decided literary faculty. They were none of them in the true vein of his genius as it afterward unfolded itself.

It had been determined, in spite of his father's limited means, to send Cullen to one of the New England colleges, and for that purpose in the years 1808 and 1809 he was put to school, first in North Brookfield, and then at Plainfield, Mass. He entered the Sophomore class at Williams College in 1810, but, becoming dissatisfied with the narrow range of study pursued there, obtained an honorable dismission at the end of the year with a view to removing to Yale College. This purpose, however, he was unable to accomplish, owing to his father's poverty, and for a while he continued his studies at home. It was at this time that one day, in the course of a ramble through the primeval forests, while comparing Blair's poem of "The Grave" with one of like tenor by Bishop Portens, and having in mind also Henry Kirke White's "Ode to the Rosemary," his meditations framed themselves into a poem called "Thanatopsis," which, after it had been committed to paper, he put aside and seems to have forgotten altogether. He began his law studies in 1812 at Worthington with Mr. Howe, afterward judge of the court of common pleas, and completed them in Bridgewater in 1815, where he was admitted to the bar as an attorney of the common pleas. He took up his professional residence in Plainfield, Mass., where he wrote his "Lines to a Waterfowl," but he remained there only eight months, and then removed to Great Barrington, Berkshire co., where he continued to practise for the next nine years. His life in Great Barrington was one of literary rather than professional success, for it was but a short time after his arrival that he became well known as an author. His father, a State senator from Hampshire county, having accidentally discovered the "Thanatopsis" and a fragment now known as "An Inscription for the Entrance to a Wood," took them to Boston, where they were published in the *North American Review* of Sept., 1817. They produced a very decided impression, as well they might; for to "Thanatopsis," in its profound philosophy and majestic movement, belongs "the glory of the morning star that glitters in the front of day." No American poet had yet written anything equal to it in grandeur and beauty. Dr. Bryant was credited at first with the authorship of this poem, a mistake which was not corrected until brought to the attention of the author himself three or four months afterward by the editor, who wrote to him: "All the best judges say that it (the fragment) and your father's 'Thanatopsis' are the very best poetry that has been published in this country." Both father and son were solicited to become regular contributors, and in the next year (1818) the latter made his first appearance as a prose-writer. He reviewed for the periodical Brown's *Collection of American Poetry*, and in his criticism of the poets of the time dwelt upon their defects as poets, charging them with a want of self-reliance, inspiration, freedom, and simplicity. It was the coming poet clearing away the rubbish that lay in his path and dismissing to a deserved oblivion his predecessors, who were only pretenders to "the art and faculty divine."

In 1821, Mr. Bryant became a contributor to Mr. Dana's *Idle Man*, a periodical of great force but short life, for which he wrote the "Yellow Violet," "The West Wind," "A Winter Piece," "Green River," and "A Walk at Sunset"—poems which fully sustained the reputation he had won by his earlier pieces. They procured for him, doubtless, the invitation which came the same year to prepare a poem for the annual meeting of the Phi Beta Kappa Society of Harvard University. This he called "The Ages," and after it had been read before a considerable collection of the literary men of the day he was persuaded by Mr. R. H. Dana, Mr. Allston, Prof. E. T. Channing, and others to allow it to be printed. With a small number of other pieces it was published before the close of the year, but few as they were, only eight in all, they stamped the author of them at once as the best poet that the New World had yet produced, and some of them, such as "Thanatopsis," "The Waterfowl," and "Green River," have scarcely been surpassed by his maturer efforts. The plaudits with which they were received in Boston, and particularly the praises of Gulian C. Verplanck of New York, seem to have drawn Bryant more and more to literature. A new periodical, called the *United States Literary Gazette*, having been established in Boston by Theophilus Parsons, afterward an eminent jurist, he wrote for it continuously during the years 1823–24, contributing many of his best effusions, such as "The Rivulet," "The Murdered Traveller," "Autumn Woods," "Hymn to the North Star," "Monument Mountain," "The Forest Hymn," and "June."

In 1825 the poet abandoned the legal profession, and made his way, "a literary adventurer," as he called himself, to New York, where he was introduced to Cooper, Sands, Verplanck, and other literary celebrities, and to the artists Vanderlyn, Cole, Durand, Inman, Morse, and many more. An offer of the editorship of the *New York Review*, a new monthly magazine established in 1825, which he accepted, induced him to settle with his family in the metropolis. For this periodical he wrote both in prose and verse, but the enterprise did not succeed, and his prospects were dark indeed when he was invited to a temporary place on the staff of the New York *Evening Post*, a leading daily newspaper, founded by Alexander Hamilton and conducted by William Coleman. At the same time he took part, in conjunction with Robert Sands and G. C. Verplanck, in the editorship of an illustrated annual called *The Talisman*, for which several of his best-known poems were written, among them "The Past" and "The Evening Wind." He wrote for the *Tales of the Glauber Spa*, which he edited shortly afterward, his stories of "Medfield" and "The Skeleton Cave." The death of William Coleman, proprietor of the *Evening Post*, in 1829, advanced him to the position of editor-in-chief and part proprietor of that journal, when for some years, owing to the exactions of his new duties, he abandoned the Muses. The profession of editor then was held in no great esteem, but his vast range of knowledge, his manly dignity in discussion, and his determination to make his journal an example of respectability, helped to lift the profession from the reproach of its earlier and less resolute days. He pursued a steady policy of general principles, criticised social and political changes, and helped to direct the current of national thought into the wisest and best channels. Not to be lost, however, to the literary world altogether, he resolved to make a collection of all the poems he had written up to that time. It was published in 1832 by Elam Bliss of New York, and received the most favorable judgments from competent critics, including such as Longfellow, Prescott, and Legaré. A copy of the book having been sent to Washington Irving in England, that gentleman found a publisher for it there, on condition that he would put his name on the title-page and that he would change a line in the "Song of Marion's Men," which reads "The British soldier trembles," into something less likely to disturb the patriotic sensibilities of British subjects. The words were altered so as to read, "The foeman trembles in his camp," a change which Mr. Bryant did not disapprove, but which William Leggett, editor of the *Plaindealer*, but formerly an associate on the staff of the *Evening Post*, characterized as pusillanimous. This led to a sharp correspondence between the essayist and the poet, which had no other result, however, than to increase their esteem for each other. The volume was noticed with little discrimination, but with praise, in the *Foreign Quarterly Review* and by John Wilson of *Blackwood's*, who quoted at length descriptive passages which, he said, "could only have emanated from a genius of a very high order."

Although Bryant had entered his new profession with strong Federal affinities, his reading inclined him to the doctrines of political economy which had begun to reflect their light from the other side of the Atlantic, and his sympathies and convictions soon identified him with the Democratic party. He supported Jackson in his fierce warfare upon the national bank, which so aroused the hostility of the merchants of New York that the prosperity of his journal seemed for a time extremely doubtful. The spirit with which it was conducted, however, enabled it to take a prominent place among its Democratic brethren. It supported Van Buren's administration during the hot financial contests brought on by Jackson's experiments on the currency, but it was not so strongly partisan as to be unwilling to rebuke its tendencies toward an alliance with the slaveholders of the South. Abolitionism was then beginning to excite a tempest of obloquy and antagonisms, and the *Evening Post*, though it did not formally side with the abolitionists, incurred a great deal of odium by its defence of the rights of free speech and of petition. From a brief visit to Europe which Mr. Bryant made in 1834, and during which he passed through France, Italy, and Germany, he was recalled by the illness of his assistant, Mr. Leggett, and the losing fortunes of his journal. For many years it was only by arduous and persistent struggle that it kept alive under the intense and growing prejudices of the community. But Mr. Bryant refused to surrender any of his convictions, was denounced and excommunicated by the party to which he was attached, and was more than once threatened by the violence of the mob. He opposed the annexation of Texas when that scheme was broached in 1838, and the consequent war with Mexico; he was instrumental in forming the Free-Soil party in 1848 to counteract the introduction of slavery into the new territories acquired from Mexico; and, though he continued to act at times with the Democratic party, his allegiance to it was so remittent that he found no difficulty in 1856 in taking an active and leading part in the formation of the great Republican party which has since governed the nation. He was in 1860 one of the presidential electors of Abraham Lincoln, whose confidence and friendship he enjoyed, and whose administration, during the difficult times of the Civil War, was greatly aided by Mr. Bryant's private as well as public communications. All through the war he was conspicuous as a vehement defender of the cause of the Union, an advocate of the emancipation of the slaves, of the great constitutional amendments by which universal freedom was secured, and, after the war, of such an adjustment of the relations of the States as would lead to their permanent reconciliation and harmony.

As an editor Mr. Bryant exercised a great influence. He composed slowly and with care, and, like Pope, invariably used old envelopes and scraps of waste paper, of which he economized a store. A fund of anecdote and poetical quotation gave sprightliness to his writings, and he wielded the more delicate weapons of irony and ridicule with greatest zest, though he never refused a more direct engagement with his adversaries when the cause demanded it. He belonged not so much to that school of journalism which strives to make a complete record of the events of the day as to that which endeavors to act on public sentiment. The sincerity and earnestness with which he presented his principles, his quick native sense of justice, the vigor and directness and the ability of his discussions, his wonderful insight into the tendencies of measures which sometimes became prophecy, his known probity, and his independence of managing politicians, gained him respect even in quarters where his opinions were distasteful. For this reason his journal, though it never attained as wide a circulation as some others, was felt to be a power in the land, greatly dreaded by those whom it assailed, but warmly admired by those who coincided with its views of policy. No other journal was more instrumental in bringing about the great changes of opinion which ended in the destruction of slavery.

Mr. Bryant was not so much absorbed in his editorial occupation as to prevent his engaging in other literary pursuits. He possessed, without being an orator, a certain facility and grace of speech which procured him many invitations to deliver addresses on public occasions. He presided and spoke at the banquet given to Kossuth in 1851, at the Burns centennial in 1859, at the Schiller festivities in the same year, at those of Goethe in 1875, and at the inauguration of the statues to Shakespeare (1872), Scott (1872), Morse (1871), and Halleck (1874), and at many other events of the kind. Nearly all the great public institutions of New York, such as the Academy of Design, the Mercantile Library, the Metropolitan Art Museum, were furthered by his eloquence; but the most important performances of this kind were his funeral eulogies at different times upon his contemporaries and friends—Thomas Cole (1848), J. Fenimore Cooper (1852), Washington Irving (1860), Fitz-Greene Halleck (1869), and Gulian C. Verplanck (1870). They are marked by great simplicity yet fervor of style, fine characterization, agreeable reminiscences, and the utmost elegance and purity of language, and were thought of sufficient interest to justify a separate publication of them, in a volume entitled *Orations and Addresses*, in 1873.

Nor was he prevented by his arduous labors as a journalist from extensive tours of travel, not only in his own country, but in the Old World. He went to Illinois, where his mother and brothers had settled, while it was yet in a state of wilderness; several times to the South, both before and after the war; to Cuba three times, in 1849, 1852, and 1872; to Europe six times, in 1834, 1845, 1849, 1852, 1858, and 1867, embracing in one of these visits (1852) a tour to the East; and he spent a part of every summer in excursions through some of the Middle and New England States. Of these various journeys he wrote descriptive letters for his newspaper, which in 1850 were collected in a volume and published as *Letters of a Traveller*. A second series was published in 1859 as *Letters from Spain and Other Countries*, and a third, composed of *Letters from the East*, was added in 1869.

His writing of poetry seems to have been rather the amusement than the labor of his life. It was carefully done, and is for the most part serious and meditative, and to some extent even sombre, but it is not considerable in quantity, nor is any of it what may be called a *magnum opus*. He was too much engaged in actual duties to allow himself to indulge his fancies. After the edition of his poems in 1832 he published another, somewhat enlarged, in 1842, to which he added the same year *The Fountain, and Other Poems*. Three years later a fine illustrated edition of the whole was issued from the Philadelphia press, and in 1863 he sent forth *Thirty Poems*, which were subsequently incorporated in the editions of 1864 and 1873. His poems do not number in all over one hundred and fifty, most of them short, but a few of them, like "The Ages," "Sella," and "The Little People of the Snow," extending to several hundred lines. He was solicited, especially by his friend R. H. Dana, to devote his powers to some work of greater magnitude, but he invariably declined. He held the opinion elaborated by Poe in later years, that a long poem was, like a long ecstasy, impossible, and that the great works of Homer, Dante, Spenser, Tasso, and Milton were merely a succession of short poems strung together upon a thread of story. His most elaborate work was undertaken in his old age, when he was in his seventy-second year. The death of his wife in that year imposed upon him the necessity of some distraction from the sorrows of his loss, and he began a translation of the immortal poems of Homer. The *Iliad* he brought out in 1870, and the *Odyssey* in 1872. This was a prodigious effort for a man at his time of life, but it was completed "without haste and without rest," and the general opinion of the critics was that no finer rendering of the old Greek bard had ever been made in the English tongue. Mr. Bryant was at first inclined to put his verses in the hexameter form, but finding that metre impracticable, he fell back upon blank verse, which is doubtless the noblest and most flexible measure of which our language is susceptible.

Mr. Bryant's literary life may be said to divide itself into three periods: First, that of his youth and early manhood, when he gained his position as a poet of high rank which was never afterwards shaken; second, that of his middle age, when he appeared chiefly as the politician struggling daily to assert the principles of freedom in its many applications to persons and to trade, and when, in the estimation of a large number of his contemporaries, he was under a cloud of misapprehension and dislike; and third, the period of old age, when prosperity had returned to him, when his services to the best interests of society were acknowledged, and when men of all classes and parties seemed to take delight in doing him honor. The honors showered upon him came in such abundance as almost to overwhelm him. His seventieth birthday (1864) was the occasion of a public reception given by the Century Club, of which he was one of the founders, and at which all the chief poets of the nation—Emerson, Longfellow, Whittier, Lowell, Boker, Stoddard, etc.—bore testimony to their appreciation of his merits both as a literary man and a citizen, and nearly all the prominent artists—Durand, Huntington, Wittredge, Kensett, Gifford, Bierstadt, and others—united in the gift of a portfolio of pictures illustrative of his principal works. Again, on the recurrence of his eightieth birthday, a large number of citizens of all parts of the country joined in an address of congratulation to him, announcing the presentation to him, as soon as it should be completed, of a large and beautiful silver vase whose designs commemorated the incidents of his life and writings.

It was in the midst of these tokens of reverence, full of years and honors, and with every faculty preserved by a life of singular abstemiousness and care, that he was invited by the Italian residents of New York to deliver an address upon the life of the Italian patriot Mazzini, whose statue had just been placed in Central Park. He was there exposed to the sun for some hours, which is supposed to have done some injury to his brain; for, after walking across the Park to the house of an acquaintance, he fell as he ascended the steps, and received a concussion by which he was stunned, and of which he died on the 12th of June, 1878. He was buried upon a hillside at Roslyn, his country-seat, on the northern shore of Long Island.

Bryant's position in the poetical literature of his country, like Irving's in its prose, was that of a pioneer. He was the first of our poets to achieve a lasting distinction, and, as his life was an unusually long one, he continued to exert an important influence upon the literary development of the nation. All the younger poets looked up to him as a father, and, though in the interval between his first appearance in 1821 and his later publications in 1845 and 1864 great changes had taken place in public taste, he managed to keep his hold upon the admiration of his countrymen. Keats and Shelley in England had given a form to poetic inspiration which was followed up by Tennyson, the Brownings, and more lately by Rossetti and Swinburne. In our own country Longfellow had risen with his captivating music, Emerson with his profound insight, Whittier with his Tyrtean and soul-stirring lyrics, Lowell with his varied and rich harmonies, and Poe with his weird incantations; but these did not thrust the older poet aside. They were, indeed, among his warmest admirers, and instead of supplanting him helped the public to a fresh appreciation of his merits. The reason of this permanence of possession was that Bryant ever adhered to the great primal simplicities of Nature, to those elemental feelings which are universal with mankind, and which may be forgotten for a time, but constantly recur. His poetic creed was a distinct one: he believed that the best poetry was to be found "in the vicissitudes of human life, in the emotions of the human heart, and in the relations of man to man," and that "he who can present them in combinations and lights which at once affect the mind with a deep sense of their truth and beauty is the poet;" and to this belief he remained steadfast. As a meditative poet he ranks with the highest of our language, Cowper and Wordsworth; his studies of Nature, his reflections on the great movements of life, are full of profound morality and tender pathos, while his choice of language exhibits an exquisite nicety of taste which never has been surpassed. (G.)

BUCHANAN, ROBERT WILLIAM, an English poet, was born at Caverswell, Staffordshire, Aug. 18, 1841. He was educated at the High School and University of Glasgow, and in his twentieth year went to London to devote himself to journalism and literature. His first volume of poems, *Undertones*, appeared in 1860. It was followed by *Idyls and Legends of Inverburn* (1865) and *London Poems* (1866). Among his other poems are—*White Rose and Red* (1870); *The Book of Orme* (1870); *Napoleon Fallen, a lyrical drama* (1871); *Drama of Kings* (1871); *Master-Spirits* (1873). He has also written a tragedy, *The Witch-Finder*, and *The Comedy of a Madcap Prince*, both of which have been produced on the stage. Among his prose works are—*The Land of Lorne* (1871), recounting his visit to the Hebrides, and some romances—*The Shadow of the Sword* (1877); *A Child of Nature* (1881); and *God and the Man* (1881). He published in the *Contemporary Review* in 1871 a severe article on *The Fleshly School of Poetry*, which provoked a sharp controversy with Swinburne and others whom he had criticised. As a poet he displays great earnestness and a high sense of the poet's vocation, but his romances are superior to his poems in interest and power.

BUCHNER, FRIEDRICH CARL CHRISTIAN LUDWIG, a German physician and materialist philosopher, was born at Darmstadt, March 29, 1824. He is the third son of Dr. Ernst Büchner, physician to the grand duke of Hesse-Darmstadt. After attending the schools of his native town he was sent to the University of Geissen in the spring of 1843. For a year he studied philosophy, and then at his father's desire devoted himself to medicine. In the political agitation of that time he became a contributor to the newspapers, and he also edited the *Literary Remains* of his brother George, with an introductory biography. He afterwards resumed his medical studies at Würzburg and Vienna. His articles in medical journals attracted notice from the members of his profession, and for three years he was assistant clinical professor and lecturer in Tübingen University. He still continued with remarkable activity his contributions to political as well as medical journals. His essays in the latter gradually prepared the way for his celebrated work on *Force and Matter* ("Kraft und Stoff"), first published in 1855. The authorities of the university, alarmed at its bold and arrogant materialism, deprived the writer of his professorship. He then returned to the practice of medicine. He published *Nature and Spirit* (1857), *Physiological Sketches* (1861), and *Nature and Science* (1862). In 1864, he translated into German and edited Lyell's *Antiquity of Man*, and in the same year his own work appeared in an English dress. In 1868 he published some lectures on Darwin's theory, which have since been revised and enlarged. Further results of his investigations and reflections on these subjects were given to the world in 1869 in his work on *The Place of Man in Nature, Past, Present, and Future.* In 1872, Dr. Büchner visited the United States, and travelled through thirty-two States, lecturing in German on scientific and philosophic subjects. Some of these lectures were at once published in English under the title *Materialism, its History and Influence on Society* (New York, 1873). A later work, *Aus dem Geistesleben der Thieren* (1877), was translated into English as *Mind in Animals* (London, 1880), and has also appeared in French and Dutch. His latest works are *Liebe und Liebesleben in der Thierwelt* (1879), *Licht und Leben* (1882), and *Die Macht der Vererbung* (1882). Since its publication in 1855 *Kraft und Stoff* has been translated into English, Danish, French, Dutch, Italian, Spanish, Swedish, Polish, Hungarian, Roumanian, Modern Greek, and Armenian, and its author is regarded as the foremost champion of materialism. Several replies to his work have appeared, the ablest of which is perhaps that of M. Paul Janet, professor at the Sorbonne: *Le Matérialisme contemporain en Allemagne* (1864).

BUCKNER, SIMON BOLIVAR, a lieutenant-general in the Confederate army, was born in Hart co., Ky., April 1, 1823. He entered West Point in 1840, and was appointed second lieutenant in the Second infantry. In 1845 he was appointed instructor of ethics at West Point, but in May, 1846, was ordered to Mexico, where he served with distinction. At the close of the war he was appointed assistant instructor of infantry tactics at West Point; afterwards he served on the Plains, and in New York as captain of the subsistence department. In 1855 he resigned his commission and settled at Louisville. In 1860 he took part in reorganizing the militia of Kentucky into a State guard, and was appointed its commander-in-chief. Gen. Buckner was opposed to the war, and endeavored to secure the neutrality of Kentucky, but finding this could not be done, he joined the Southern Confederacy in August, 1861 He was appointed a brigadier-general Sept. 16, and occupied Bowling Green, Ky., with 5000 men. When Fort Donelson was attacked in February, 1862, he was third in command, but his superior officers having escaped, he surrendered the fort Feb. 16. He was afterwards kept four months in solitary confinement in Fort Warren, Boston harbor. In August, 1862, he was exchanged and made a major-general, with a division command at Chattanooga. He took part in Bragg's Kentucky campaign, and at its close was assigned to the command of the department of the Gulf, with his headquarters at Mobile. From the defence of this city he was called to Knoxville, Tenn., to command the department of East Tennessee. He joined Bragg's army in time to take part in the battle of Chickamauga. In 1864 he was assigned to a command in the army of Gen. E. Kirby Smith, and afterwards appointed to the command of the district of Louisiana and made a lieutenant-general, but he was not much engaged in active service after this time. On May 26, 1865, a convention for the surrender of the Army of the Trans-Mississippi was arranged between Gens. Buckner and Price on the part of the Confederates, and Major-general Canby of the Federal army. By the terms of the surrender Gen. Buckner was not allowed to return to Kentucky, and settled in New Orleans. In 1866 he was elected president of an insurance company in New Orleans.

BUCYRUS, the county-seat of Crawford co., Ohio, is on the Sandusky River, 12 miles W. of Crestline, and at the intersection of the Pittsburg, Fort Wayne, and Chicago Railroad with the Ohio Central Railroad. The central offices, supply-dépôt, and car-works of the latter road are in this place. It has a court-house, two banks, three weekly newspapers (one German), nine churches, a large public school-house, and is free of debt. It has two foundries, four saw-mills, two planing-mills, three flour-mills, a tannery, and manufactories of hosiery, knitting-machines, copper kettles, ploughs, farming implements, bent wood, and carriages. Here the skeleton of a mastodon was found in 1838. Population, 3835.

BUELL, DON CARLOS, an American general, was born near Marietta, Ohio, March 23, 1818. He graduated at West Point in 1841, and served in the Florida War and on frontier duty till 1845. He took part in the Mexican War as captain of infantry under both Gens. Taylor and Scott, and was severely wounded at Churubusco, Aug. 19, 1847. He was afterwards employed in the adjutant-general's office at Washington, and as assistant adjutant-general in various parts of the country. At the commencement of the Civil War in 1861 he assisted in organizing the troops collected at Washington, and in November was placed in command of the Department of the Ohio with headquarters at Louisville, Ky. He was appointed major-general of volunteers March 21, 1862, and his department united with that of the Mississippi under Maj.-Gen. Halleck. He set out to join Gen. Grant in the movement along the Tennessee River, and with one of his divisions reached the battlefield of Shiloh on the evening of April 6, when Grant had been driven back to the river by the Confederates under Gen. Albert S. Johnston, who was killed in the fight. When the rest of Buell's troops came up the next day, the Confederates, now under Gen. Beauregard, were driven back to Corinth, Miss. In June, Gen. Buell established his headquarters at Huntsville, Ala., but in July, Gen. Bragg, who had succeeded Beauregard, marched into Kentucky with 45,000 men, captured Frankfort, and threatened Louisville. Buell, leaving Nashville strongly fortified and well garrisoned, marched northward with an army larger than Bragg's, but chiefly composed of fresh recruits. Gen. Halleck at this time wished to remove Gen. Buell from command, and offered the position to Gen. G. H. Thomas, but the latter declined it under the circumstances, and urged Buell's retention. Distrusting the efficiency of his own army, Buell followed Bragg closely, determined not to fight, but to force him out of the State. Part of his army, however, under Gen. A. M. McCook, fought part of the Confederates at Perryville, Oct. 8, and through want of co-operation on the part of the other corps commanders suffered defeat. A court-martial was held, and Buell was acquitted, but Andrew Johnson, then military governor of Tennessee, protested against his returning to duty in that State. He was therefore transferred to the command of the Department of the Gulf, but declined, and resigned June 1, 1864. He was a thoroughly educated soldier, but was too reserved to win the affection or confidence of his men. He has been president of the Green River Iron-works in Kentucky since 1865.

BUENA VISTA. See MEXICAN WAR.

BUENA VISTA, a city of Chaffee co., Col., is near the confluence of Cottonwood Creek with the Arkansas River, and at the junction of the Denver and Rio Grande Railroad with the Denver and South Park Railroad. It has a fine court-house, an opera-house, three churches, a fine school-house, three weekly newspapers, and a good fire department. Being close to some of the richest silver-mines in Colorado, its chief industry is mining, and it contains works for sampling, concentrating, and reducing the ores; 300,000 bushels of charcoal are burnt monthly in this vicinity for smelting purposes. The Arkansas Valley is here 7 miles wide. Population. 2141.

BUFFALO. See BISON.

See Vol. IV. p. 396 Am. ed. (p. 448 Edin. ed.).

BUFFALO, the county-seat of Erie co., N. Y., is the third city in population in the State and the thirteenth in the United States. It is at the lower end of Lake Erie and at the head of Niagara River, in 42° 53′ N. lat. and 78° 55′ W. long. Its distance from Chicago is 539 miles; from Cleveland, 183 miles; from New York City, 423 miles by the Lake Erie and Western Railroad, while it is somewhat greater by the New York Central and Hudson River Railroad, and less by the New York, Lackawanna, and Western Railroad. The first of these roads has branches to Niagara Falls on the north and to Jamestown on the south. The second road has branches to Niagara Falls and Lockport. The Buffalo, New York, and Philadelphia Railroad taps the oil and coal regions of Pennsylvania. Connection is also made at Lewiston with the Niagara Falls branch of the Rome, Watertown, and Oswego Railroad for all points on the southern shore of Lake Ontario. Buffalo is also the western terminus of the newly-built (1883) West Shore Railroad, and the eastern terminus of the Lake Shore and Michigan Southern Railroad; the Canada Southern Railroad; the "Loop Line" of the Great Western Railroad of Canada; the Buffalo and Lake Huron branch of the Grand Trunk Railway of Canada; the Buffalo, New York, and Erie Railroad; the Buffalo Creek Railroad; and the new line to Chicago known as the "Nickel Plate," or the New York, Chicago, and St. Louis Railroad. This large increase in railroad facilities has thrown Buffalo's marine commerce into the shade by comparison only. The opening of the Erie Canal in 1825 was the beginning of its commercial prosperity, as is shown by the history of the Board of Trade. The harbor is, next to that of Erie in Pennsylvania, the finest on Lake Erie. The Buffalo River, which has been made navigable for over a mile, is protected on either bank by extensive breakwaters at the point where it empties into the lake. An outer breakwater 4000 feet long protects the mouth of the river at a distance of half a mile, while the whole harbor is guarded by Fort Porter. By these means and by constant dredging the harbor readily allows the entrance of vessels of 17 feet draught as against 13 feet draught in 1853. The business of elevating, transferring, and storing grain is carried on by 22 elevators, with a storage capacity of from 100,000 to 1,200,000 bushels; 7 transports, with from 40,000 to 60,000 bushels storage capacity; and 6 floaters. The majority of these elevators, etc., are controlled by an elevator association. The navigation on Lake Erie, as is shown by the records since 1827, usually opens about the middle of April, though it has opened as early as March 14, and again has been delayed as late as the middle of May. The healthfulness of Buffalo is shown by its death-rate being but 14 per 1000 yearly, and the average mean temperature standing at 48°. The leading articles manufactured in Buffalo are—ale, boats and lake vessels, boilers, boots and shoes, boxes, bridges, carpets, carriages, castings, cigars, flour, furniture, furnaces, oils, organs, paper, pianos, scales, soaps, and mill furnishing. Aside from these there are extensive forges and iron-works of various kinds. The lumber trade is largely increasing. For municipal purposes the city is divided into thirteen wards, each of which sends two aldermen to the board. There is also a board of health, and there are water, police, and fire commissioners. The water-works are owned by the city. Fifteen steam-engines, five chemical engines, three hook-and-ladder trucks, and one hose-cart constitute the protection against fire as administered by a paid fire department. Law and order are preserved by an efficient police force. The State also has an arsenal here. There are forty-one hotels, four large markets, and twenty-one cemeteries, most of which are of limited size. Three national banks, eight State and other banks, five savings banks, and four private bankers attend to the monetary wants of the city. The religious wants are supplied by the following churches:

Baptist, 11; Catholic, 22; Episcopal, 12; Jewish, 4; Lutheran, German Evangelical, etc., 21; Friends, 1; Methodist, 15; Presbyterian, 12; Unitarian, 1; Universalist, 1; Congregational, 1; total, 101. Newspapers and periodicals are issued as follows: daily, 8; weekly, 21; monthly, 6. There are six libraries, the larger of which are those of the Young Men's Association (41,000 vols.) and the Grosvenor free (25,000 vols.). The public-school system comprises a central high school and thirty-seven public schools, with a total force of 454 teachers. There are also a State normal school, a female academy, and several undenominational schools, either private or belonging to orphan asylums or other endowments. The Roman Catholics have twenty-two parochial schools, two colleges, and seven convents. Aside from the Society of Natural Sciences and the Historical Society, there are the Fine Arts Academy, the Mechanics' Institute, and the Catholic Institute. In practical charities Buffalo is not surpassed by any city of its size. Besides the State asylum for the insane, it contains the Providence lunatic asylum, St. Mary's institute for deaf-mutes, a city dispensary, an eye-and-ear infirmary, and the following hospitals: General, Homœopathic, Sisters of Charity, St. Francis, and Small-Pox. Buffalo is a port of entry, and at its custom-house large revenues are paid to the U. S. Government from the "District of Buffalo Creek."

Buffalo was founded in 1801 by the Holland Land Company, which bought all the tract west of the Genesee in the State of New York. The whole of this tract was erected into a county called Genesee, with the county-seat at Batavia. In 1821, Erie county was formed, with its county-seat at Buffalo, formerly known as Buffalo Creek and New Amsterdam. As a compensation for its loss by fire at the hands of the British, Dec. 31, 1813, Congress afterwards voted an appropriation of $80,000, which was a great stimulus to the village. It became a city in 1832, and its growth has been very marked from that date to the present. The village of Black Rock was annexed in 1853. The population has increased as follows, according to the U. S. census: 1810, 1508; 1820, 2095; 1830, 8653; 1840, 18.213; 1850, 42,261; 1860, 81,129; 1870, 117,714; 1880, 155,137; 1883 (estimated), 171,500.

BUGGE, Elseus Sophus, a Norwegian linguist, was born Jan. 5, 1833, in Laurvig. He studied at the University of Christiania, and when only seventeen years old wrote his first literary work, *On the Permutation of Consonants in the Speech of the Norse People* (1850), which was followed by a series of similar productions. In 1858 appeared his edition of *Old Norse Folk-Songs*, a standard work in Norse ballad literature. From 1858 to 1864 he studied in Copenhagen and in Berlin, supported by his own Government, and on his return to Norway the Storthing created for him a chair of comparative philology and Old Norse. In 1864 and 1865 appeared his scholarly editions of the *Volsunga* and *Hervarar-saga*. His most important work is his splendid edition of the *Elder Edda* in the original text (1867), a work which supersedes all previous editions. Of scarcely less importance are his articles on runes, which he published in the *Tidsskrift for Philologi og Pædagogik* and in the *Aarböger*, and especially his epoch-making *Interpretation of Runic Inscriptions from Rökstenen in East Gothland*, published in the Swedish *Antikvarisk Tidsskrift*, vol. v. In 1867 he edited *Plautus*, and in 1878 he published his *Old Italian Studies*. He has also written several articles on Romance etymology in the Paris *Roumania*, supplying many gaps in the works of Diez, Littré, and others. During the past two years he has been occupied with his studies on the *Origin of the Norse Mythologic and Heroic Saga*, of which two parts have appeared. He traces a large part of the old Eddaic stories to comparatively late sources and to Greek or Roman originals. He does not, however, seem able to sustain this theory. (R. B. A.)

See Vol. IV. p. 459 Am. ed. (p. 513 Edin. ed.).

BUILDING ASSOCIATIONS. In so far as the title "building associations" pretends to be descriptive of the character of the societies which in Pennsylvania are called by that name, it is a misnomer. It is simply indicative of a result that has followed from these organizations—namely, the extension of building operations. In Massachusetts they are known and may be defined as co-operative saving-fund and loan societies.

On the 3d of January, 1831, the first association organized in this country was begun, under the name of the Oxford Provident Building Association, at Frankford, a suburb of Philadelphia. It was started as a philanthropic measure. Some of the originators were acquainted with the principles of co-operative societies in Great Britain, and obtained their ideas of building associations from that country. From the Oxford Provident thousands of associations have sprung up in all sections of the United States, and special legislation in many of the States has been called into being to meet their wants and requirements.

The associations are organized on the basis of a capital stock divided into shares of an equal fixed amount. In Pennsylvania the par value of each share is $200. In some of the States a maximum capital stock is fixed by law, and a limit is placed upon the number of shares that any one member may hold. Membership is obtained by subscription to one or more of the shares. No form of proposition, initiation, or balloting is required. When once organized the whole end and object of the association is to make each share subscribed for worth in actual cash or an equivalent its par value. All other results that may be accomplished are incidental and secondary. The true object is to accumulate assets sufficient to distribute to each member the par value of the shares for which he has subscribed. It is evident that this end might be attained at once were each member to pay into the treasury the par value of the shares for which he has subscribed, or it might be attained in time by regular payments made on account and hoarded in a common treasury. Such methods of payment would, however, be in direct opposition to the principles of the associations, one of which is to make money by the judicious investment of money. Payments are made on account of each share in regular periodical instalments of a certain fixed amount. The time when these are made is called the meeting-night. In Pennsylvania the meeting-night is once a month, and an instalment of $1 on each share is then due and payable. In this manner the associations combine all the advantages of saving-fund societies, and at the same time it is compulsory on the depositor to deposit, for a small fine is imposed upon every default in the regular payment of instalments. If a member be in default for a certain time fixed by the by-laws, he ceases to be a member, and if he be a non-borrower he is entitled to receive the withdrawal value of his shares, less the dues and fines he may owe to the association. If he be a borrower, the amount of his indebtedness to the association is realized from the securities he has given for the fulfilment of his obligations as a borrower, and the balance, if any, placed to his credit. If the payments made by stockholders were simply to be hoarded, the shares in Pennsylvania associations would be worth their par value in exactly 200 months. The theory of the associations is, however, that the par value will be reached, or, in common parlance, the association will be at an end, in about half of that time. It has not been a rare thing for associations to expire in from nine to ten years. The method by which the shares thus attain their par value in so short a time is one of the distinctive features of building associations. The stockholders are divided into two classes—namely, borrowers and non-borrowers; any member may belong to either or both of these classes. No one who is not a member is permitted to borrow. The duties of the non-borrower are very simple, consisting chiefly in the regular payment of the instalments upon the shares which he owns. In addition to these, the borrower has other payments to make. Borrowing is made upon shares, and is, in effect, an anticipated realization by the borrower of the par value of the shares borrowed upon before they are actually worth their par value. For instance: 200 members form an association, each subscribing for one share of stock of the par value of $200. When the first monthly instalment is paid in, there will be $200 in the treasury; in other words, the par value of one share. Instead of waiting for every one of the shares to become worth its par value, any member may anticipate this result and borrow from the treasury the par value of his share—namely, the $200. The treasury will then be empty. For the privilege of thus anticipating the borrower pays what is usually called a "premium," which is a sum either deducted from the loan before the borrower receives it or paid by him in instalments. The amount of the premium is determined by the highest offer or bid made by any member at the meeting when the specific loan is awarded. In addition to the premium the borrower pays interest at the rate, in Pennsylvania, of 6 per cent. per annum. The interest is paid in monthly instalments. To guard the society against loss, the borrower gives security for the regular payment of the instalments on the shares borrowed upon, the interest on the loan, and, where the premium is paid in instalments, the regular payment of the instalments. The shares borrowed upon are also assigned as collateral to the association. The security generally offered is either real estate or stock of the association. The former is usually in the shape of a mortgage, while the latter is, in substance, simply an assignment to the association of shares of stock sufficient in actual paid-up value to secure the society against loss. Any marketable security may be offered, and, unless the by-laws prohibit, may, in the discretion of the directors, be received. When the association has attained its object in making all the shares worth in money or its equivalent their par value, the securities are returned to the borrower and his debt is cancelled. The non-borrower of course receives the cash par value of his shares, but the borrower, having already realized the par value, receives only a cancellation of his debt.

This, in brief, is a general description of building associations. But, although there is one genus, there are several species, characterized by different methods of charging premiums. In the old Philadelphia societies the method of borrowing was by a percentage on the sum loaned, and deducted at once from the amount given to the borrower. For instance, if the highest premium offered should be 30 per cent. and the successful bidder be awarded a loan upon one share, he would receive $200 less 30 per cent., or $140. The $60 he pays for the privilege of anticipating the par value of the share. In many societies the borrower pays interest on the par value of the shares borrowed upon, even though the premium is deducted as above mentioned, while in other societies interest is paid only on the sum actually received by him. Some associations require the borrower to pay the premium bid in monthly instalments. There is a third class, called "interest-in-advance associations," in which the premium offered is in the shape of interest. The bidder offers interest for so many months, and he who offers for the longest term is awarded the loan. A minimum number of months is fixed by the by-laws below which no bid will be received. The interest that the bidder offers is then deducted at once from the loan, and until the period for which he has bid expires he simply pays into the society his regular instalment-dues upon the shares on which he has borrowed. Should the association not end at or before the expiration of the number of months for which he has bid interest, he is charged regular interest thereafter during the continuance of the association. Provision is made in all associations for withdrawing members and borrowers desirous of paying off loans before they are due. In the former case the withdrawing member receives not the actual value of his shares, but, in addition to the payments he has made, a certain proportion of the profits or a certain rate of interest, as determined by the by-laws. In the latter, the borrower receives back a certain portion of the premium he has paid, the amount of which decreases with the number of years during which he has had the use of his loan.

It was said in the beginning of this article that it was not unusual for associations to expire in from nine to ten years. A difficulty was early met with, however, in lending money during the last few years of the existence of the society. Borrowers who desired loans for short periods were few, and although the amount of premium became less as the society increased in age, yet this advantage was set off by the fact that all loans matured at the expiration of the association. Another difficulty was experienced in obtaining new members. Every month the shares of course increased in value, and the purchase of one became more difficult. A new member was obliged to place himself on the same plane with those who had been members from the beginning of the association. To overcome these and other difficulties, serial or permanent associations were introduced, and are now almost the only ones in existence. In these the stock is issued in series, and each series is in effect a new association. In many societies new series or new issues of stock are made every year, while in others they are made as the exigency requires. The funds received from all the series are thrown into a common treasury, and loaned out to the highest bidder in whatever series he may be. Accounts are kept with each series, and the profits adjusted among them. The expiration of one series causes no difficulty in the working of the society, for other series are still in operation. It frequently happens, however, that stockholders of a series that has expired are unable to obtain at once the cash equivalent of their shares. The reason of this is that all the money has been loaned out, and although the association has assets sufficient in shape of mortgages and other collaterals, yet there is no ready money in the treasury. This difficulty is easily overcome by a provision in the by-laws similar to a section in the Massachusetts law, requiring a certain percentage of receipts to be set aside to provide for the exigency of a series expiring. These funds may be invested in short loans.

(P. B.)

BULGARIA. Like the other *vilayets* of European Turkey which contained any considerable proportion of Christian inhabitants, Bulgaria suffered for more than four centuries the most cruel oppression at the hands of the Turks. The Bulgarians, owing, perhaps, to their composite ancestry of Finnish and Slavic races, were a more patient and long-suffering people than the more purely Slavic Bosniacs and Servians, but their wrath, when once aroused, was the more terrible. The oppression of the Turkish landlords and officials, and of the tax-farmers, grew more and more intolerable with every year of the present century, and led to frequent insurrections, which were put down with excessive cruelty and bloodshed. In 1827, in 1848, in 1862, and in 1870 there were uprisings of the Bulgarians against the oppression of their masters, and many Bulgarians lost their lives.

See Vol. IV. p. 462 Am. ed. (p. 516 Edin. ed.).

The Bulgarian Church, founded in the ninth century, had always claimed independence of the Orthodox Greek Church, though similar to it in doctrines and forms. The Bulgarians cling to it with the most intense devotion; they hailed, therefore, with the utmost joy the re-establishment of that Church under a Bulgarian exarch, bishops, and clergy in Feb., 1872. A small proportion of the Bulgarians had, indeed, been forcibly converted to Mohammedanism in the fifteenth century, and their descendants, called Pomaks, were still Mohammedans, but these were mostly in sympathy with the Christian Bulgarians: their worst enemies were the Osmanli Turks, Tatars, and Circassians, all fanatical Mohammedans, who constituted about one-third of the population. After the uprising in Bosnia in 1875 the Bulgarians, who had petitioned for years for the redress of their grievances without obtaining any relief, were disposed to rise also. They demanded—(1) that the country should be governed by Christian instead of Turkish officials, since more than two-thirds of the population were Christians; (2) that the Bulgarian language should be recognized as official, or at least that all documents in Turkish should be accompanied by a Bulgarian translation; (3) that the taxes should be collected honestly and justly, and without distraint or extortion, and that the tax-gatherers should not be allowed to quarter themselves upon the rayahs or farmers; (4) that the Bulgarian and Turk should be equal before the law, and the wrongs of the one should be righted as fully and promptly as those of the other; (5) that the honor of their women and girls should be protected, and that they should no longer be the prey of the Turks; (6) that the Christians should be allowed to enter the military service on the same terms as the Mohammedans, and should no longer be subjected to the odious exemption tax. All these demands had been repeatedly granted—on paper. In the autumn of 1875, the Bulgarian committee at Bucharest, composed of Bulgarian exiles and some Russian emissaries, advised the formation of committees in the larger towns to press these demands more urgently. There was no intention of actual insurrection at this time, but the movement only aggravated the difficulty. It led to the affair of Eski Zagra, in which a considerable number of innocent Bulgarians lost their lives.

There were no further attempts at insurrection until May, 1876, when the younger and more restless of the Bulgarians, who had been petitioning the sultan through the winter for the redress of their grievances without success, began to talk of rising and procuring by force the rights which were so persistently refused. They were prompted to this course by several considerations: Bosnia had risen in such force as to obtain, in part at least, the relief which she sought; Servia, though still delaying, was about to proclaim war against Turkey, and the opportunity was thought to be a favorable one for Bulgaria; the revolutionary committee at Bucharest, composed of Bulgarian exiles, Roumanian adventurers, and Russian emissaries, and wholly under Russian control, was sending its agents into Bulgaria to stir up an insurrection. This committee seems to have aimed at exciting the Turks to acts of violence, so as to give the Russian Government a better pretext for engaging in war with Turkey.

The Bulgarians had no leaders, no organization, no arms. The committee sent some young men of no capacity or military education to become local leaders, and raised about $10,000 from the Bulgarians to purchase arms, every dollar of which was wasted. The unarmed insurgents were led against villages of no great importance, of which they took possession without resistance, and threw up some slight intrenchments. In a few instances they killed Turkish officials who resisted them, but when regular troops were sent against them they either fled or surrendered. A few months later Mr. Eugene Schuyler, then American secretary of legation at Constantinople, made a searching examination of this insurrection, and reported that only fifteen villages were thus seized and only 115 persons slain in all, most of them in fight. There was no burning of villages and very little plundering, no murders of women and children, and no violation of women or girls.

In suppressing this insignificant insurrection the Turkish authorities were guilty of atrocities which have no parallel in modern times. What they did is graphically told in the reports of Mr. Schuyler and Mr. Walter Baring of the British legation, both of whom visited the scenes of the massacres. In the sandjaks or provinces of Philippopolis, Slivno, and Tirnova, and the neighboring part of the province of Sophia, seventy-nine villages and towns, many of them of from 5000 to 10,000 inhabitants, were wholly or partially burned, and very many others pillaged. At least 9000 houses were burned, and 72,000 persons left without shelter. Property worth more than $50,000,000 was either destroyed or carried away; 15,000 persons were killed, and many were thrust into loathsome prisons, where they died from starvation. Two-thirds of the slain were women and children.

The deposition and subsequent death of the sultan in June, 1876, and the deposition of his successor, Murad V., on the 31st of August, did not modify the policy of the Ottoman Government.

The atrocities in Bulgaria and elsewhere had roused the indignation of all Europe. Yet strenuous efforts were made by some of the powers to prevent war on the part of Russia, and to extort from Turkey such concessions to its Christian population, and such measures of reform, as might avert the impending danger. A conference of the great powers was held in Constantinople in December, 1876, and the strongest pressure was brought to bear upon the Porte; but all in vain. Controlled as it was by the most fanatical Mohammedans, it could not recede from any of its previous actions, nor would it give any pledges of a less violent and cruel course in the future. A protocol prepared by Russia, and signed by the representatives of the six powers at London, March 31, 1877, proved equally ineffective, though its demands were very moderate. There remained, then, nothing but war, which was declared by the czar against Turkey on the 24th of April (N. S.). The history of this Russo-Turkish War concerns this article only in the fact that all the important battles of that war in European Turkey were fought on Bulgarian soil. The war virtually closed with the armistice of Jan. 25, 1878, though the Treaty of San Stefano was not signed till March 3, 1878. During its continuance of nine months there were severe battles at Rustchuk on the Danube, Nikopol, Yeni-Sagra, at the Shipka Pass (three or four conflicts), Kara Hassanksi, Lovatz, Kacelyo, Kadikoi, Provitz, Etropol, Kamarli, Ak-Kalanka, and Pirot, besides the capture, recapture, and protracted siege of Plevna.

At the congress of the great powers to determine the results of the war, which met in Berlin June 13, 1878, the condition of the vilayets of European Turkey was considered, as well as that of the neighboring principalities which had previously been tributary to Turkey. By Article I. of the treaty made and ratified by this congress it was ordered that "Bulgaria should be constituted an autonomous and tributary principality, under the suzerainty of His Imperial Majesty the sultan. It will have a Christian government and a national militia." Article III. ordered, "The prince of Bulgaria shall be freely elected by the population and confirmed by the Sublime Porte, with the consent of the powers. No member of any of the reigning houses of the great European powers can be elected prince of Bulgaria. In case of a vacancy in the princely dignity the election of the new prince shall take place under the same conditions and with the same forms."

By the constitution of 1879 the legislative authority is vested in a single chamber, called the "National Assembly of Bulgaria." The members of it are elected by universal manhood suffrage, at the rating of one member to every 20,000 of the population, counting both sexes. The prince has the right of nominating, in addition, a number of deputies equal to half the number returned by the popular vote. The time of duration of the assembly is four years, but it may be dissolved at any time by the prince, when new elections must take place within four months. The executive power is vested, under the prince, in a council of seven ministers, viz.: for foreign affairs and public worship, of the interior, of public instruction, of finance, of public works and agriculture, of justice, and of war. The amount of the annual tribute which the principality of Bulgaria should pay to the suzerain court (of Turkey) was to be fixed by an agreement between the powers signatory of the treaty at the close of the first year of the working of the new organization. It was also provided that these signatories should calculate this tribute on the mean revenue of the territory of the principality, and that they should take into consideration what proportion of the debt of Turkey should be assumed by Bulgaria.

Area and Population.—Bulgaria, under the Turkish rule, was of uncertain bounds. The territory inhabited principally by Bulgarians included nearly all of European Turkey east of the Vardar River, except the vilayet of Constantinople, and extended from the Danube to the Ægean Sea. It included also the Dobrudja and most of Bessarabia. A distinction was made in regard to the territory north of the Balkans, which was often designated Bulgaria proper, and by the Turks Tuna, or the province of the Danube, and had an area of 32,665 square miles. The new principality whose boundaries were fixed by the Treaty of Berlin has a considerably smaller area. It has the Danube on the north, the Black Sea (in part) on the east, the Balkans on the south, and Servia on the west. Its area is estimated at 24,360 square miles, and its population, according to the census of Jan. 1, 1881, was 1,995,701. It is divided into nine provinces—viz. Widin, Sistova, Rustchuk, Varna, Tirnova, Sofia, Philippopolis (which does not include the city of that name), Slivno, and Skoblia or Uskup. Each of these is divided into several circles or districts. The present capital of the principality is the city of Sofia, population 20,541. Other important towns are Varna, 24,649; Shumla, 22,921; Rustchuk on the Danube, 26,867; Tirnova, the ancient capital, 11,500; and Widin, 13,602 inhabitants. There are many smaller towns, but the population is largely rural and agricultural.

Industries, Exports and Imports.—The Bulgarians are almost entirely farmers and herdsmen. Their principal crops are of the cereals, of which their annual export, previous to their becoming independent, averaged 1,500,000 tons. In 1880 and 1881 the crops were much smaller than usual in consequence of unfavorable weather, but the crops of 1882 were large. The soil is very fertile, and admirably adapted to the culture of wheat, fruits, etc. The mountainous districts afford excellent pasturage, and there are immense flocks of sheep and goats and very large herds of cattle. The principal exports, aside from grain, are wool, tallow, butter, cheese, hides, flax, silk, and timber. Silk-culture is somewhat extensive. The manufactures of Bulgaria, being of the simpler sort, are consumed at home. There are deposits of coal, which have hitherto been neglected, but which are now worked to some small extent in connection with valuable ores of iron. The imports are mostly of iron, coals, textiles, and other manufactured goods.

Financial Condition.—The expectation which was entertained, that the revenues of Bulgaria would exceed the expenditures, has not thus far been realized. In 1881 the revenues were reported at $4,600,000, and the expenditures, which undoubtedly included the tribute to Turkey, as $5,461,600, showing a deficiency of $861,600. The proportion of the Turkish debt assumed by Bulgaria, has not yet been made public. The standing army numbers 16,520, and there is a large reserve and landwehr. The principal railway is that from Rustchuk to Varna.

Education is at a very low ebb, but is improving, under the resolute efforts of the best citizens to make the Bulgarian language the official and common language of the nation. Schools of all grades are multiplying, and there is already a Bulgarian literature, though as yet of only moderate extent. The Bulgarian language belongs to the Slavic group of tongues, but it has been corrupted by the introduction of many Turkish, Tatar, and Greek words. In its written form it is intelligible to the other Slavic nationalities.

Present Ruler.—The reigning prince, elected by the Bulgarian Constituent Assembly in April, 1879, is Alexander I., son of Prince Alexander of Hesse and nephew of the late empress of Russia. He was born April 5, 1857. The title is hereditary, and his annual civil list is $1,200,000. As a German ruler over a non-Germanic people he has met with some difficulties, but his administration has been thus far moderately prosperous.

For further information the reader may consult Cyprien Robert, *The Slave Provinces of Turkey;* Mackenzie and Irby, *Travels in the Slavonic Provinces of Turkey in Europe, 1862–75;* W. Forsyth, LL.D., *The Slavonic Provinces South of the Danube*, 1876; Malcolm Maccoll, in *Contemp. Review*, 1876, "The Christian Subjects of the Porte;" Jireček, *Geschichte der Bulgaren* (1876); Hilferding, *Serben und Bulgaren* (1874); E. S. Clark, *Races of European Turkey* (1878); Brockett, *The Bogomils of Bulgaria and Bosnia* (1879).

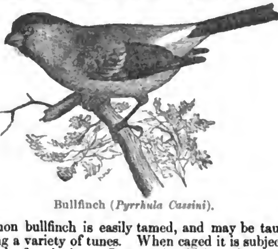
(L. P. B.)

BULL, Ole Bornemann, an eminent Norwegian violinist, was born at Bergen, Feb. 5, 1810. He studied under Spohr at Cassel in 1829, but received so little encouragement that he began the study of law in the University of Göttingen. In consequence of a duel he fled to Paris, and there was meditating suicide by drowning in the Seine when a lady of rank, noting in his features a resemblance to those of her deceased son, gave him the means to appear in concerts and assisted him in gaining friends. In seven years Ole Bull had gained a fortune by his performances. He visited America in 1843, and remained two years, and then tried to establish schools of art and literature in Norway, but had difficulties with the Government. He then purchased 120,000 acres in Potter co., Pa., to found a Scandinavian colony of the name of "Oleona," but here he lost his fortune and was obliged to abandon the undertaking. After other reverses he recommenced giving concerts in Europe and America, and was again successful. In 1870 he married a German lady in Wisconsin.

His violin-playing was most brilliant and attractive, and of the character best adapted to please large concert audiences rather than small coteries of students of art. Airs with variations formed the principal pieces in his programmes, and therefore the music is more like that of De Beriot than that chosen by Joachim. But, although not classical, it has afforded great pleasure to multitudes not inclined to regard music reflectively and seriously, but simply to enjoy it. He died Aug. 18, 1880. His *Life*, written by his wife, appeared in 1882.

BULLFINCH, a bird of the family *Fringillidæ*, the *Loxia pyrrhula*, L., now the *Pyrrhula vulgaris* of naturalists. There are several other species of the genus *Pyrrhula*, formerly supposed to be confined to the Old World; but a true bullfinch (*P. Cassini*, Baird) has been ascertained to occur in Alaska. The birds of this genus have an extremely thick and short bill, turgid in all its outlines; the crown, wings, and tail mostly black; the upper parts gray, with white rump; the male with most of the under parts crimson or red of some shade. The common bullfinch is easily tamed, and may be taught to sing a variety of tunes. When caged it is subject to a kind of melanism. It nests in thickets, building a nest of twigs and rootlets, and lays four or five pale-bluish, speckled eggs.

See Vol. IV. p. 463 Am. ed. (p. 518 Edin. ed.).



Bullfinch (*Pyrrhula Cassini*).

(E. C.)

BULL RUN, a small stream in North-eastern Virginia, forming the boundary between Fairfax and Prince William counties until it enters the Occoquan River about 14 miles from where that stream empties into the Potomac. Bull Run has given its name to two battles fought during the Civil War—one on July 21, 1861, and the other on August 29 and 30, 1862. The Confederates called them the first and second battles of Manassas.

The former was the first real pitched battle of the war, and was waged between the two largest armies engaged up to that time on this continent. The Federal forces were commanded by Brig.-Gen. Irvin McDowell, and the Confederates by Gens. Beauregard and Joseph E. Johnston.

Lieut.-Gen. Scott was still in command of the Federal army, but was rendered by age and infirmity incapable of taking the field in person. The Union army, in front of Washington from the Chain Bridge to Alexandria, consisted of about 45,000 men, principally volunteers, with a battalion of 800 regulars. Gen. Robert Patterson was at Martinsburg with about 18,000 men, principally three months' volunteers. There he was confronted by Gen. Johnston with 8000 men. Patterson's general instructions were to keep Johnston in his front as a diversion to McDowell's proposed movement. McDowell received orders to begin his march on the 15th of June to attack the Confederates at Manassas Junction on the Alexandria and Orange Railroad, about 35 miles south-west of Washington. A glance at the topography will show that the defence of this point must be made along the line of Bull Run, a natural intrenchment, whither, on hearing of the Federal dispositions, the Confederates had retired through Centreville. McDowell's army was composed of five divisions, and contained 34,320 men. Gen. Runyon was ordered to march in rear to guard the communications, his most advanced regiments being 7 miles in rear of Centreville. This, with other slight deductions, reduced the moving column to about 28,000 men.

Along the stream the Confederate army occupied a line 8 miles in length. It consisted of six brigades, and two other brigades were in the rear as a support. The total effective force was 21,833 men, with 29 guns.

The Union army was set in motion on the afternoon of July 16, to converge by different roads upon Fairfax Court-house. This force, goodly in numbers, was an army only in name—undrilled, undisciplined, entirely ignorant of its commanders, with no cohesion, expecting soon to be discharged; a mob in uniform, inspired only with a vague and illusory hope.

McDowell's first plan was to feign an attack in front, and to move in earnest upon the enemy's right flank; but the country was so wooded and so little known that with such troops he was obliged to abandon this. He then determined to make his vigorous attack on their left flank. On the 18th, Tyler's division, which was in advance, reached Centreville, and, finding it evacuated, he with mistaken zeal pushed on to Mitchell's Ford, but soon found his advance exposed to such an artillery-fire as obliged him to fall back in confusion: he ordered forward a battery, and engaged in an artillery-duel which caused the enemy to retire across the ford and to call for reinforcements from Early. The Federal loss in this preliminary and unintended action was about 100; that of the Confederates, 78. After this McDowell made a careful reconnoissance to avoid all such chance encounters. This and other delays frustrated his purpose to make the attack on the 20th, and thus, as will be seen, greatly diminished his chance of success, especially as numbers of the three months' men were now clamorous to leave, their time having expired. But the worst result of the delay was that it enabled the main body of Johnston's "Army of the Shenandoah" to arrive and take part in the action. That general had arrived in person at noon of the 20th, bringing with him T. J. Jackson's brigade of five regiments and Bee's of four, which were in position on the morning of the battle on the 21st. Thus 6000 men and 20 guns had come up to reinforce Beauregard, realizing McDowell's fears: he could only now hope that Patterson was on their heels. He was to be disappointed. On leaving Patterson's front, Johnston's force had marched rapidly through Ashby's Gap to Piedmont, where they had taken the railroad to Manassas. Jackson's brigade was posted in the rear of Bonham, and Bee's in support of Cocke. The Confederates had a great advantage in a superior knowledge of the ground. Johnston was of higher rank than Beauregard, but he cheerfully accepted the plan of battle formed before his arrival, and left the general direction to the latter.

In pursuance of his plan to turn the enemy's left, McDowell, leaving Miles's division at Centreville, and unaware as yet that Johnston's force had come up, directed Hunter and Heintzelman to cross at Sudley's Ford, then to turn down the stream to Stone Bridge. Tyler was at the same time to attack and carry the Stone Bridge in front, join them as they came down on the right bank, and by a rapid movement seize the Manassas Gap Railroad and cut off the Confederate rear. They were all directed to carry four days' cooked rations, which it was hoped would last until supplies could reach them from Alexandria. Miles was to make a simultaneous demonstration from Centreville, with one brigade, at Blackburn's Ford.

Congress had adjourned pending the battle, and crowds of citizens and members of Congress had come to applaud the expected victory. The combined movement was ordered for the dawn of Sunday, July 21, at half-past two in the morning, so that Tyler would be in position at four, and Hunter and Heintzelman at Sudley's at six. The Confederate leaders, not yet aware of McDowell's plan, had determined to assume the initiative and attack the Federal force before the arrival of Patterson, whom they expected immediately after Johnston. But their plan was disconcerted, and they found themselves upon the defensive. The night of the 20th was exceedingly hot. Tyler's movement was delayed, and this kept Hunter and Heintzelman back. The former did not reach the Stone Bridge until six o'clock, and it was nearly ten before Hunter arrived at Sudley's. He crossed, however, unmolested, and marched down the right bank, followed by Heintzelman. Evans, who held the Stone Bridge, thought at first that Tyler's was the main attack: he was soon undeceived, and rapidly changed front on a line parallel to the Warrenton turnpike. Hunter placed Burnside in position, with Griffin's battery. Burnside attacked so fiercely that Evans called for reinforcements, which were supplied by Gen. Bee with six guns from the batteries of Imboden and Richardson. Burnside, pressed by this new force, was supported by Col. Sykes with the battalion of regulars. Gen. Hunter was wounded at this time, and the command of the division devolved on Burnside. Porter came up on Burnside's right; Sherman's brigade of Tyler's division came across a ford just above Stone Bridge; the left wing of the Confederates was driven back in confusion, and victory seemed secure for the Federal cause. The hope of the Confederate generals was now not to conquer, but to extricate themselves from utter destruction. To the military critic it seems clear that, instead of attacking in front, the Federal tactics should have been to pass around the already discomfited left of the enemy to the Manassas dépôt, by which the disorderly crowd would have been enveloped and captured. The former course was, however, adopted, giving an advantage to the Confederates. They were now on the plateau, and McDowell at the foot of the slope. He continued to press them and their resistance became stronger every moment. By twelve o'clock Johnston and Beauregard were on the plateau, where were 7000 men, well posted and partially concealed in the thickets and protected by the fire of thirteen guns. To dislodge them, the Federal force which had reached the plateau was about 10,000 strong, with twenty-two guns, Porter of Hunter's division on the right, Franklin and Wilcox of Heintzelman's in the centre, and Sherman and Keyes on the left. The batteries were commanded by Griffin, Ricketts, and Arnold. Burnside's troops were out of ammunition, and were unable to participate in the action. Howard's brigade was still upon Bull Run. The Confederate army had taken heart and repelled every attack. By a fatal mistake, Griffin allowed a force of the enemy to come upon him, thinking that they were his own battery supports. His battery was taken and retaken, but at last was left upon the field. The preponderance was still in favor of the Federal troops, when a new element came in to turn the scale. This was the appearance on the unprotected Federal right of Elzey's Confederate brigade, led by E. Kirby Smith, the last contingent of Johnston's Army of the Shenandoah which had left Patterson's front—1700 fresh men thrown upon an exposed flank at a critical moment. Smith, guided by the firing, had stopped the cars at the nearest point, and had come into action at a double-quick on the Confederate left. This turned the tide: the enemy seconded this vigorous attack by an advance along the line. McDowell's force was arrested, driven back, rolled up, routed. It melted away, not more from panic than from want of cohesion. Instead of retreating by the nearest routes, the commands rushed back on the roads on which they had come, making thus long détours in their flight. The men threw away everything, broke through and tumbled over Howard's brigade, crossed the stream above Cub Run, the bridge over which was soon obstructed by a broken wagon. To rally them was impossible; all attempts to cover the retreat failed. Behind them were the Confederate cavalry and artillery. The reserves at Centreville could not stay the flying mass, but joined it, and in the midst of the wildest confusion what was left of the army made no stop until it was under the guns of the capital. The disaster was complete. Jefferson Davis, the Confederate President, had arrived on the battlefield at four o'clock. As he came up, the stream of Confederate fugitives on the road to Richmond convinced him that his army was defeated, when he found, to his astonishment, that their victory was perfect. The estimate of losses is not exact. Those of the Confederates were about 378 killed, 1489 wounded, and a few taken prisoners. The Federal army lost 481 killed, 1011 wounded, 1460 prisoners, and 25 guns captured or destroyed.

In the *second battle* of Bull Run, in August, 1862, the Union army was commanded by Major-Gen. John Pope, and the Confederates by Gen. R. E. Lee. The former had been assigned on June 26th to the command of the Army of Virginia, consisting of all the Union forces in Virginia except those under Major-Gen. McClellan, then in front of Richmond. The attempt to capture the Confederate capital having failed, McClellan was ordered Aug. 3d to remove his army to the Potomac at the mouth of Acquia Creek. Gen. Pope had left Washington July 29th to threaten Gordonsville and prevent Lee from concentrating his forces to attack McClellan while the removal was going on. Gen. "Stonewall" Jackson, who had already been operating near Gordonsville, resisted Pope's movements, but did not prevent him from advancing to the Rapidan. Pope had about 49,000 men, while Jackson had only 23,000. When Gen. Lee saw McClellan actually withdrawing, he ordered Gen. Longstreet with about 32,000 men to march against Pope, and the latter retired to the line of the Rappahannock to await the arrival of reinforcements from McClellan's army. Finding it impossible to cross this river in front, Lee then sent Jackson on a hazardous expedition around the Union right to cut Pope's railroad communication at Manassas Junction. Jackson, having passed through Thoroughfare Gap in the Bull Run Mountains, which had been left entirely unguarded, reached the railroad at Bristoe Station, and afterwards destroyed immense supplies at Manassas Junction intended for Pope's army. He then withdrew towards the former battlefield of Bull Run, where he could be more readily joined by Longstreet, who was also coming through Thoroughfare Gap. Pope, supposing the enemy to be still in the neighborhood of Manassas Junction, ordered his scattered corps to concentrate there, and even when he found this place deserted still inclined to the belief that Jackson had gone to the east to destroy the Union stores. But the latter, who had marched north-west near the battlefield of Bull Run, where the deep cutting of an abandoned railroad furnished a strong defence, soon came to the conclusion from the movements of Pope's army that it was in full retreat to Washington. The battle of Gainesville, brought on accidentally on Aug. 28th, revealed to each side more clearly the object of the other, and on the next morning Pope felt confident that he would capture or destroy Jackson's army unless it should be joined by Longstreet, whom he supposed to be still distant a day's march. In fact, however, Longstreet was already at Gainesville, and joined Jackson at Groveton about noon. At 9 A. M. Pope had issued a joint order to McDowell and Porter, who were on the left of the Union army, to move on Gainesville and to be ready to fall back behind Bull Run at night for supplies. Porter had already marched from Bristoe Station back to Manassas Junction and towards the enemy, but, being isolated, did not make an attack. McDowell, finding the execution of the movement impracticable on account of Longstreet's march past Gainesville, withdrew to join the rest of Pope's forces. Porter remained where he was, watching the enemy in front, sending out scouts to find McDowell, and waiting for further orders. Meantime, a desperate battle was fought at Groveton, and Jackson, who stood strictly on the defensive, seemed to be driven back. Gen. Pope sent to Porter an order dated 4.30 P. M. ordering him to push into the action at once on the enemy's right flank. The order was received about 6 P. M., but Porter, on account of Longstreet's presence in his front, delayed moving, and early the next morning, after new orders, joined the main army. On this day (Aug. 30th) Longstreet's troops were massed south of the Warrenton turnpike, while Pope's attention was entirely directed to Jackson's smaller army on the north side. He ordered Porter to advance, supported by Hatch on the right and Reynolds on the left. This attack was pressed vigorously, compelling Jackson to send to Lee for reinforcements, but Longstreet instead brought artillery to bear on the front of Jackson's position. The attacks farther to the right were not serious, for Longstreet now began to assail the left flank of the Union army. Although taken by surprise, the Union troops, under Col. G. K. Warren, occupied and held for a long time Bald Hill, a strong position south of the pike; and when, at last, they were driven from this hill, another hill close by Bull Run was held by Gen. Sykes with two brigades of regulars and a number of other troops. To hold it was essential to the safety of Pope's army, which was now in full but orderly retreat before Jackson's advance. When darkness set in the regulars were withdrawn, and Gibbon's brigade was stationed there till after 8 P. M. Soon after midnight the last of the Federal army crossed Bull Run and destroyed the bridge, the army retiring in good order to Centreville. The Confederate loss was reported at 7241, but was probably greater, and that of Pope's army about 11,000, but there was also a large number of stragglers. As the Union army had thus again retreated almost to Washington, while the campaign had been opened by a too boastful proclamation, public judgment turned strongly against Gen. Pope, and a few days later he was removed from his command, Gen. McClellan being again appointed to the command of all the forces. Gen. Pope made two reports of the operations of his army, and attributed his failure to the lack of co-operation or treacherous conduct on the part of the officers who had come from Gen. McClellan's army. In consequence of these charges, Gen. Fitz-John Porter, who had remained in command of his corps, was tried by court-martial Nov. 27, 1862, and was convicted of disobedience to the "joint order" and to the "4.30 P. M. order" of Aug. 29th. On Jan. 21, 1863, he was sentenced to be cashiered. He professed his entire innocence, and repeatedly asked for a rehearing of his case. This was finally granted by Pres. Hayes in April, 1878, and a board of army officers under the presidency of Gen. J. M. Schofield was convened. By their report, made in April, 1879, they exonerated Gen. Porter. He has since applied to Congress for restoration to the rolls of the army, but thus far without effect. The controversy has not yet been fully settled.

BÜLOW, HANS GUIDO VON, a German musician, was born in Dresden, Jan. 8, 1830. He cared little for the art of tones in his early years, but after a long illness he suddenly and unaccountably found himself craving for music. In 1848, while engaged in the study and practice of law at Leipsic, he was taught counterpoint by Hauptmann. In 1849 he became a member of the University of Berlin, and published several political articles. On hearing the opera of *Lohengrin* at Weimar, under the conductorship of Liszt, Bülow gave up the faculty of law and went to Zürich to consult with Wagner. The following year (1851) he began a course of study under Liszt's direction, and in 1853 started on his first concert-tour. Two years later he united with Messrs. Stern and Marx in the formation of a music-school. Subsequently he attempted, with Wagner's co-operation, to institute at Munich a singing-school for the special purpose of training artists for the operatic stage. Bülow has since given many concerts in all parts of Europe and America, and especially distinguished himself as a conductor of Wagnerian operas. He married a daughter of Liszt, who afterwards was divorced from him and became the wife of Richard Wagner.

Bülow's chief compositions are *Opus 20* (*Symphonisches Stimmungsbild Nirwana*); *Opus 16* (a ballade for orchestra in "Der Sänger's Fluch"); and music for Shakespeare's *Julius Cæsar*. *Il Carnevale di Milano*, which consists of ten *ballabili e intermezzi* for the pianoforte, is an interesting collection of movements that have attracted the attention of critics from the ingenious manner in which the melodies are developed and intertwined, and specially for the employment of part-writing, which is so rarely found in a galop or waltz.

BUNKER'S HILL, commonly called BUNKER HILL, an eminence opposite Boston near which was fought the first real battle of the Revolutionary war on June 17, 1775. The British army, under Gen. Gage, numbering 10,000 men, occupied Boston, where, landward, they were shut in by the Americans, the cordon becoming stronger day by day. Gen. Artemas Ward was at Cambridge with 9000 infantry and four companies of artillery; Gen. Thomas, with 5000, composed of troops from Massachusetts, Connecticut, and Rhode Island and three companies of artillery, was on a line from Roxbury to Dorchester: this formed the right wing. The left wing lay from Medford to the Chelsea Hills. The peninsula upon which Charlestown stands lies opposite the northern side of Boston, separated from it by the Charles River, which was commanded by the British battery of Copp's Hill on the Boston shore. On this peninsula are two elevations: the one nearest the extremity, known as Breed's Hill, is seventy-five feet high; and the other, called Bunker's Hill, one hundred and twelve feet high. Both these commanded the town and the shipping in the river. This peninsula is connected with the mainland by a very narrow strip of land called the Neck, over which the road to Cambridge passes. A council of war was held by the American generals to consider the propriety of fortifying the peninsula. Gens. Ward and Warren opposed the plan, but it was carried by the urgency of Putnam and Pomeroy; Col. William Prescott also favored it. A little before sunset on the 16th of June a body of 1200 men, with picks and shovels as well as their muskets, was paraded in front of the headquarters at Cambridge, and, starting at 9 P. M., crossed the Neck. They were commanded by Col. Prescott and led by an engineer, Col. Gridley, who had before examined the ground. They moved so quietly that they were undiscovered. The question at once presented itself, Which eminence should they fortify? The crests of Bunker's and Breed's Hills are about 700 yards apart. The orders were explicit to fortify the former, but when on the ground the opinion of Putnam prevailed that it should be Breed's Hill. The lines of the redoubt were soon laid out, and although there was great delay the men worked with a will. Patrols who were sent down to the shore heard the British sentinels opposite crying "All's well." By morning a strong redoubt eight rods square had been erected, and an exterior line of breastworks extended from the crest of Breed's Hill to the slough. The entrenching tools were then sent to Bunker's Hill. At dawn on the 17th the work was seen by some sailors on the British ships of war, and they immediately opened fire, doing very little damage, however, as only one man was killed. The surprise was complete. Boston was roused. Gen. Gage came down to Copp's Hill, from which, through a glass, he could descry Col. Prescott on the parapet. In a council of war hastily called it was decided that the works must be stormed, and, as it was not probable that raw militiamen would fight, the storming-party should land directly in front and charge up the hill. Meantime, the Americans were sleepy and hungry and scantily supplied with ammunition. Fresh men were needed, and Prescott sent to Ward for reinforcements. The latter at first was not disposed to comply, but later sent Gen. Stark with 500 New Hampshire troops: a few of these were retained to fortify Bunker's Hill, but the main body reached the redoubt.

See Vol. IV. p. 466 Am. ed. (p. 521 Edin. ed.).

About noon the Americans saw twenty-eight barges leave Boston in parallel lines, filled with troops in scarlet uniforms and bringing several brass field-pieces. The force was commanded by Major-Gen. Howe, under whom, as second, was Gen. Pigot. They landed at Moulton's Point, a little to the north of Breed's Hill, and halted to form the columns of attack and to await the coming of reinforcements which Howe requested from Gage. These were sent, and landed between Moulton's Point and Charlestown. The Americans made good use of this time in strengthening the redoubt and in making a novel kind of entrenchment which was to do good service. There was a post-and-rail fence running down to Mystic River. A few feet in rear of this posts and rails were set up, and the space between was filled with new-mown hay. This was proof against musket-balls. At two o'clock Warren arrived: he had been appointed a major-general, but had not yet received his commission. He therefore declined the command and served as a volunteer. Immediately after this the assault was begun. Pigot, with the left wing, marched up to the redoubt, while Howe, with the right, undertook to turn the American left. A brisk discharge of the field-pieces and howitzers of the assaulting force covered their approach: they then delivered one volley of musketry and rushed forward. The Americans reserved their fire until Pigot was within thirty or forty yards of the work, when a volley was given with fatal effect. The troops halted; many fell back, some approached to within pistol-shot, when another well-directed volley and a flanking fire from a few American troops in Charlestown threw them into utter disorder and drove them back to the landing. Howe's right wing fared no better: they advanced along the Mystic to the post-and-rail defences, where they were received by similar volleys at short range, and were driven back to the boats.

At this time, while the Americans were preparing to resist another attack, Charlestown, which was built chiefly of wood, was set on fire by a carcass thrown from Copp's Hill, and was soon wrapt in flames. On every eminence and on many housetops were interested spectators, giving dramatic effect to the action.

The British lost no time in organizing a second attack, but with no better success: again they were driven pell-mell down the hill. In conducting a third they were more prudent: instead of approaching in front, they assaulted the left flank between the breastwork and the fence, making only a feint of attack in front. Here too they could enfilade the left of the redoubt with field artillery. By this time the ammunition of the Americans began to give out; many of the men were without cartridges and their muskets had no bayonets. This third attack was successful. The British entered the work, not without a hand-to-hand struggle on the parapet, where many of the Americans fought bravely with clubbed muskets. Prescott reluctantly ordered a retreat: a last British volley killed Warren, who had displayed great valor and coolness during the entire action, and who was among the last to leave the redoubt. Stark still held the fence to cover the retreat; Putnam implored them to make another stand at Bunker's Hill, but in vain: the entire force, unpursued by the enemy, crossed the Neck and marched to Cambridge, defeated, but satisfied and defiant.

The British strengthened the captured works and erected others. The American loss was 450; the British, 1054. Among the latter was Maj. Pitcairn, who had commanded the expedition to Lexington.

The results of the battle of Bunker's Hill were greatly in favor of the American cause. It led to the evacuation of Boston by the British forces a short time after; it gave prestige to the raw troops, and showed that we had commanders only needing opportunity and development; and it opened the eyes of England to the serious and difficult character of the task she had untaken. A tall granite obelisk, 221 feet high, 31 feet square at the bottom and 15 feet at the top, marks the place of the redoubt on Breed's Hill. The cornerstone was laid by La Fayette on the semi-centennial day of the battle, June 17, 1825, when an oration was delivered by Daniel Webster. It was completed in 1842, and dedicated in 1843, when Daniel Webster was again the orator of the day. The cost was $150,000. (H. C.)

BUNSEN, Robert Wilhelm, an eminent German chemist, was born March 31, 1811, at Göttingen, where his father was professor of Oriental literature. Entering the university of his native city, he studied chemistry, physics, and geology, and graduated there in 1831. In 1833 he acquired the *venia docendi*, and in 1836 took the chair of chemistry at the Polytechnic Institute in Cassel. In 1838 he was appointed professor extraordinarius at the University of Marburg, and in 1841 was advanced to the grade of professor ordinarius. In 1851 he accepted the professorship of chemistry at the University of Breslau, and commenced there the erection of the chemical institute. In 1852 he became professor at the University of Heidelberg, which position he still occupies. On the fiftieth anniversary of his acquiring the degree of doctor of philosophy the grand duke of Baden conferred upon him the rank of privy counsellor of the first class. In 1882 the French Academy bestowed upon him the highest honor in its gift by electing him foreign associate.

His lectures have been very attractive and popular, not only from the beauty of his style, but also on account of their thoroughness and his brilliant illustrations. Those who have been familiar with him as his associates in the laboratory learned to esteem him as one of the purest and best of men—a man of kind heart and liberal disposition. He lives and works solely for the development of science, often with such enthusiasm and absorption as to make him absent-minded as regards other affairs. Hence many good stories whose point he enjoys himself. Bunsen has never married; he always has been free from family ties. He is the last of that great trio of most distinguished chemists of the earlier period of this century—Wöhler, Liebig, and Bunsen. Each of them stands pre-eminent in the branch to which he devoted his researches. Of the three, Liebig was perhaps the greatest chemical genius, but Bunsen has been undoubtedly the most eminent by reason of possessing a far more general education, and especially a thorough mathematical knowledge, which served him in investigating many questions which the mere chemist or physicist would have found most difficult. Bunsen's investigations are models of scientific thoroughness; no important point is ever lost sight of, and the whole subject is worked up in the most painstaking way and in every direction. Many of his most important investigations are not concerned with subjects entirely novel. He frequently takes up observations which either no one else had thought it worth while to follow up, or which had failed to give favorable results in the hands of others. His remarkable success with these must be attributed to his great mental resources and mechanical skill, which enable him sometimes to overcome the greatest difficulties by the simplest means.

Bunsen introduced himself to the scientific world by publishing in 1834, jointly with Berthold, an antidote against arsenical poisoning in the freshly-precipitated ferric hydroxide. Many lives have been saved by it, and Bunsen was rewarded with a gold medal by the Prussian Government. Next in order comes, in 1835, an investigation giving the chemical and crystallographic properties of a new class of ferrocyanides with ammonia, and double salts of ammonium ferrocyanide with ammonium chloride and bromide.

In 1837 he made the first announcement of one of the most important discoveries in chemistry, that of the so-called cacodyl compounds. In 1760 a French chemist, Cadet, found that if equal quantities of arsenious oxide and dry potassium acetate are subjected to destructive distillation, a dark, reddish-brown, heavy liquid is obtained which has a frightful odor, and which fumes and burns when in contact with air. Bunsen found that the chief portion of Cadet's liquid is a substance which he called "alcarsin," the oxide of a radical for which he subsequently adopted the name "cacodyl," and which is now known as "arsendimethyl." This was the *first* organo-metallic radical which was found, and the discovery opened a new field for research.

In 1840, Bunsen succeeded in the isolation from the chloride, by means of metallic tin, of the radical cacodyl C_2H_6As, a true organic metal, capable of combining with oxygen to form cacodylic oxide and cacodylic acid, which yield numerous salts; with sulphur to form analogous sulphides and sulphosalts; with selenium and tellurium to form selenide and telluride; with chlorine, bromine, iodine, and fluorine to give chlorides, bromides, iodides, and fluorides, oxysalts of these compounds, and double salts with metallic chlorides and oxides; with cyanogen, a fearfully poisonous cyanide. These all show such a strong resemblance to metallic salts that the discovery of cacodyl became one of the strongest pillars in the support of the theory of compound radicals. In making this investigation Bunsen was the pioneer in a dangerous field which required great skill in execution and steady perseverance during seven years of labor. Most of these compounds have a horrible odor, are very volatile and highly poisonous; many are spontaneously inflammable and dangerously explosive. Bunsen lost the sight of one eye by the explosion of a tube when analyzing the cyanide. This, which is one of the most beautiful compounds, crystallizes in large crystals, sublimates like camphor, and is most dangerous. Bunsen barely escaped with his life when working with it.

Whilst still engaged with the investigation of the cacodyl compounds he published several smaller chemical and mineralogical articles, and in 1838 some preliminary results of one of his memorable researches, that on the gases of blast-furnaces. The gases of charcoal-furnaces were first investigated, then, in 1840, those of the coke-furnaces used for the reduction of copper shales at Friedrichshütte near Riechelsdorf, and finally, jointly with Dr. Lyon Playfair, in 1845, those of the Alfreton iron-furnaces in England. The last especially will always stand as one of the masterpieces of scientific research, and the practical results gained by it were of the highest importance in the iron industry. When Bunsen commenced these investigations accurate methods of gas-analysis were nearly unknown, and he was obliged almost to create a new branch of analytical chemistry, on which he in 1857 published his *Gasometrische Methoden*. A glass tube closed at one end, with platinum wires sealed in, graduated with a millimetre scale, and most accurately calibrated, constituted his eudiometer, almost his entire apparatus. In order to arrive at high accuracy in gas analysis, many of the physical and chemical laws which govern such processes had to be subjected to careful and extended investigations, the most important of which were those on the influence of gases upon the combustibility of oxygen and hydrogen, on the law of the absorption of gases, on the diffusion of gases, and on the determination of the specific gravity of gases and vapors.

The year 1841 brings us another very important fruit of his fertile brain in the form of a new galvanic battery, in which he substitutes carbon for the copper or platinum element. At first this first carbon-zinc battery was unpleasant through the nitrous fumes which it emitted, but since he substituted in 1875 potassium dichromate and sulphuric acid it has attained a form which is used for telegraphic and other technical purposes as well as for research in the laboratory. In the progress of these investigations Bunsen published a number of smaller articles, the most important of which are on the thermal springs of Nauheim, on the composition of the salamanders from the copper-furnaces at Riechelsdorf, on the Carboniferous territory of the Maremma, and on the analysis of parisite, the latter by a very ingenious indirect method. Next in order came his great investigations of the volcanic phenomena of Iceland. When, in 1845, the news of the great eruption of Hecla reached Marburg, Bunsen, desiring to study the phenomena connected with it from a chemical and physical point of view, obtained leave of absence during the summer of 1846, and the time intervening was used in preparing a perfect outfit of accurate thermometers and other appliances for scientific observation. One of his objects was the study of the geyser-operations, as he was convinced that the generally accepted cavern theory was not based upon sound physical principles; and a result of his studies in Iceland was the publication of a new and ingenious theory of geyser-action. Of not less importance were his geological investigations on the processes of the formation of the volcanic rocks in Iceland. From numerous analyses of Icelandic rocks Bunsen came to the conclusion that all belong to one of two types, the extreme members of which are the normal trachytes, with an oxygen ratio between the silicic acid and the bases of nearly 3 : 0·6, and the normal pyroxenic rocks, with a ratio of 3 : 2. He made other interesting observations, and traced the agency of volcanic gases and steam in the decomposition of rocks.

In 1852 he entered upon a new field of research, the reduction of metals by electrolysis. In this investigation his perseverance and ingenuity overcame many difficulties. The first metal which he reduced from its chloride was magnesium. Subsequently, in 1854, by the use of a very dense current he separated chromium in large plates from the chloride, then manganese and aluminium; and in 1855, jointly with Dr. Matthiessen, he isolated the metals calcium, strontium, barium, and lithium. Later in 1875 the metals cerium, lanthanum, and didymium were isolated in large globules under his direction by his pupils Hillebrand and Norton.

In 1853 he introduced into analytical chemistry a neat volumetric method of very general application and great accuracy, based upon the liberation, either directly or indirectly, from any of the higher oxides, of an equivalent quantity of iodine, the amount of which he determines by titration with dilute sulphuric acid. Jointly with Roscoe, during the years 1855 to 1862 he was engaged in a very elaborate series of photo-chemical researches with reference to the laws and measurement of the chemical action of light: on photo-chemical induction; the optical and chemical extinction of rays of light, their comparative and absolute measurement, and the measurement of the chemical action of sunlight.

His next investigation was a purely chemical one, which greatly taxed his patience and skill. It is on the preparation of pure cerium compounds, the separation of cerium from lanthanum and didymium, and an investigation of their salts. This was followed by an important paper on the distinction of the different oxides of antimony, and a new method for the separation of antimony and arsenic, which was more fully developed in a subsequent communication in 1878; another one on blowpipe experiments, in which he shows that by the use of the gas-lamp, which he had introduced several years before, the presence of the different alkalies and alkaline earths in feldspars and similar minerals could easily be recognized, and even their relative quantity approximately determined.

Of all the researches of Bunsen, important as they always were, none has given such remarkable results as the introduction of the spectrum as a means of chemical analysis, which he jointly made with his colleague Kirchhoff. With the development of this branch almost a new era begins in scientific research. They were not the first, however, who observed that if a colored flame was viewed through a spectrum peculiar bright lines would appear. Sir John Herschel in 1822 and Talbot in 1834 had made interesting observations in this direction. But these observations, and others like them, had comparatively little influence upon the progress of science until, in 1859 and 1860, Bunsen and Kirchhoff, by a complete investigation, founded the method of spectral analysis, giving at first the spectra of the metals whose salts color a non-luminous flame, like those of the alkalies and alkaline earths. One of the first fruits of spectrum analysis was their discovery of cæsium, a new alkali-metal, in the mineral water of Dürkheim, distinguished by two blue lines, and shortly afterwards by that of a second alkali-metal, rubidium, showing a characteristic red line in the spectrum. The residuum obtained from this water being very scanty, they evaporated forty tons at once, in order to procure a sufficient quantity for a fuller investigation of the relations and analogies of these two new metals so closely allied to potassium. Their researches proved the existence of these metals in many minerals, mineral waters, and refuse products of chemical industries. The relations between the bright lines produced by colored flames and the so-called dark lines of Fraunhofer, the reversion of the bright lines into dark ones, the absorption-bands, the nature and composition of the light of the sun and the stars, and many other points, were gradually brought out by their more extended researches.

In 1875, Bunsen introduced his chromic-acid battery, mentioned above, and in connection with it a new apparatus for spectrum analysis by electric sparks, and gave the results of his investigation of the flame-spectra and also of the absorption-spectra produced by the chlorides of the metals cerium, didymium, lanthanum, yttrium, and erbium.

During the progress of his spectroscopic researches he was working on several other subjects, among which the investigation, made jointly with Bahr, of the earths contained in gadolinite, erbia, and yttria, their separation and determination, and of their salts, is one of the most important. This was followed in 1866 by a paper on flame-reactions, in which he shows that by very simple and ingenious methods, with hardly any other apparatus than his gas-burner, the presence of nearly one-half of all the known elements can be ascertained very rapidly and with great certainty.

There is in inorganic chemistry perhaps not a more difficult subject than the separation of the platinum metals. He has commenced this investigation with material furnished by the mint in St. Petersburg, and has overcome many of the difficulties by new and accurate methods, of which he published the first part in 1868, having especial reference to the separation of pure rhodium. In the course of this important investigation he was seriously injured by an explosion. In 1870 he described a series of calorimetric investigations, in which he determines with great accuracy the specific gravity of ice, and, based upon this, his new ice-calorimeter for the determination of the specific heat of bodies, etc. In his investigations he has been compelled to resort to more simple and accurate methods and apparatus; analytical chemistry is especially and greatly indebted to him, not only for many laboratory contrivances, such as his gas-lamp, his filter-pump, and others, but also for methods of analysis, many of which are now in general use on account of their simplicity and accuracy. (F. A. G.)

BUNTING (etym. dubious), a name applied with little discrimination to various species of birds of the family *Fringillidæ*, chiefly those composing the genus *Emberiza* of Linnæus. The bunting properly so called is *E. miliaria* of Europe. Numerous North American birds, not even of the same genus, have received the same name, as snow-bunting, *Plectrophanes nivalis;* towhee-bunting, *Pipilo erythrophthalmus;* lark-bunting, *Calamospiza bicolor;* black-throated bunting, *Spiza Americana.* There was formerly supposed to be a character of the palate by which the "buntings" collectively could be distinguished from other *Fringillidæ*, but such has proven not to be the case. (E. C.)

See Vol. IV. p. 470 Am. ed. (p. 525 Edin. ed.).

BURDEN, Henry (1791–1871), an American inventor, was born at Dumblane, Scotland, April 20, 1791. He was the son of a farmer, studied engineering at Edinburgh, and came to America in 1819. Engaging in the iron manufacture, he soon made an improved plough, and in 1820 the first cultivator used in America. In 1822 he became agent of the Troy iron and nail factory. Numerous patents were issued to him—one in 1825 for making wrought spikes, one in 1835 for making horseshoes, one in 1840 for making the hook-headed spikes used on American railroads, and another for a machine to make blooms out of puddlers' balls, and one in 1849 for a machine to make iron bars. His greatest invention, patented in 1857, was a machine for making horseshoes, by which sixty shoes are made from iron bars each minute. This machine has also been patented in several European countries. In 1833 he built an enormous steamboat, which, from its peculiar shape, was called the "cigar-boat," and he advocated the construction of large steamships for ocean navigation. He finally became sole proprietor of the iron-works with which he had long been connected, and which had been greatly enlarged under his management. He died at Troy, N. Y., Jan. 19. 1871.

BURDETT-COUTTS, Angela Georgina, Baroness, an English philanthropist, youngest daughter of Sir Francis Burdett, was born April 25, 1814. Her grandfather, Thomas Coutts, a wealthy banker, married late in life a popular actress, and left to her an immense fortune. The latter was afterwards married to the duke of St. Albans, but having no children, made Miss Burdett her heiress on condition that she should add Coutts to her name. It was also stipulated that in case she married a foreigner she should lose one-third of this fortune. On coming into possession of her wealth in 1837, she began a life of studious and systematic beneficence, giving largely, not to one particular favorite scheme of charity, but to many and widely-differing objects; and not indiscriminately, but considerately, by keeping statistics of work accomplished and to be accomplished, and gathering innumerable facts with painstaking care, that her noble deeds might not fail of their intention. The evil effects attending lavish gifts, such as injuring the self-reliance and self-respect of recipients or encouraging pauperism, have been avoided as far as possible by most vigilant and continuous supervision. She built new schools and churches in districts that were inhabited chiefly by the poor, including a handsome church at Carlisle in Cumberland and the magnificent church of St. Stephen's in Westminster, besides the three schools and clergy-house in its precincts. The bishoprics of Adelaide, Cape Town, and British Columbia she endowed with the sum of more than $250,000. She founded an establishment in South Australia for the benefit of the aborigines; provided funds for Sir Henry James's topographical survey of Jerusalem; favored and assisted the emigration of Scotch and Irish families to Australia and elsewhere under certain well-planned conditions; built a model farm for the education of the Dyaks of Sarawak; gave vessels and fishing appliances to poor Irishmen; and instituted an organization and fund for the relief of Turkish and Bulgarian peasantry during the Russian invasion, sending to the British ambassador more than $150,000. In London her labors have been incessant, for connected with the emigration scheme was a reformatory or home for poor and unfortunate women, which was established at Shepherd's Bush, in London, where, after a period of seven years, the inmates were sent to the colonies to start life afresh. To extend the benefits of the new educational plans of the English Government to poor districts that were thinly populated, she devised an elaborate scheme of providing inspecting schoolmasters, who visited various places periodically and directed the studies; which plan the Government adopted. When the Spitalfield weavers were rendered destitute by the loss of their work, she instituted schools near by in Brown's Lane, London, where adult women were fed and provided for generally, and taught to sew. Government contracts were then obtained to utilize the work done. The baroness has also given innumerable outfits for poor servants and destitute women and some hundreds of boys, who were thus enabled to enter respectively industrial homes and the royal navy.

One of the most popular schemes was the establishment of the "Shoe-black Brigade," in which boys were tested as to their real character and general fitness for promotion, and in due time were provided with work by railway companies or were admitted to the army or navy service. Where "Nova Scotia" Gardens once harbored thieves and the worst characters in London, now stand the model dwellings known as "Columbia Square," where 200 families enjoy pleasant homes at nominal cost. The baroness has also erected drinking-fountains, opened her grounds at Highgate Villa to thousands of school-children, and converted a churchyard in the heart of London into a garden of rest for the poor.

In 1871 the prime minister tendered her the offer of a peerage from the queen; the following year she was presented with the freedom of the city of London, and in 1874 that of Edinburgh. The baroness in 1882 married Mr. J. Ashmead-Bartlett, an American gentleman. (S. A. P.)

BURDETTE, Robert Jones, American journalist, eldest son of Frederic E. Burdette, accountant, of Huguenot descent, was born in the village of Greensboro', Pa., July 30, 1844. During his infancy his parents removed to Cincinnati; thence, in 1852, to Peoria, Ill., where Robert passed his boyhood and youth. He received a common-school education, graduating at the Peoria high school in 1861. In 1862 he enlisted in the Forty-seventh Illinois infantry, and served as a private soldier in the Union army during the war of the rebellion. In 1868 he entered the field of journalism as night editor of the *Peoria Daily Transcript*, retaining that position two years, when he accepted the position of city editor on the *Evening Review* of that city. On the failure of this paper in Jan., 1873, he went on the staff of the *Hawkeye* in Burlington, Ia., as city editor, rising to the position of managing editor in 1875. In 1876 he went on the platform as a humorous lecturer, still retaining a position on the editorial staff of the *Hawkeye.* His humor is racy, characteristically

American, free from grossness of any kind, and often enlisted in the service of religion. His published books are the *Rise and Fall of the Moustache*, *Hawkeyes*, and the *Life of William Penn* in the humorous series of "American Worthies."

See Vol. IV, p. 477 Am. ed. (p. 534 Edin. ed.).

BURGLARY, breaking and entering by night into a mansion-house with intent to commit a felony—a crime of a very gross character, as being aimed against the security of the citizen's home at a time when he is naturally off his guard. This crime being a felony, the perpetrator may be lawfully resisted, even to the extent of killing him; though, if he can be arrested and the crime thus prevented, it would be felonious homicide to kill him. It is not a breaking merely to enter a house through an open door or window, even if it has to be pushed farther open. Not only the violent tearing open of a door or other part of the house, however, is held sufficient; but if the latch of a door is lifted, or the sash of a window pushed up, or a closed folding window pushed open, or if, through fraudulent artifice, the inmates are induced to open the door or window and let the burglar in, or if he makes his entry through a chimney, any of these methods will be sufficient. If, moreover, the criminal enter by an open front door and afterwards break open an inner door, or if, having gotten in without a breaking, he afterwards commits a breaking in order to escape, this also will be sufficient. In order to constitute burglary, there must also be an entry, but the breaking and entering may be effected at different times, provided that both are in the night. The entry need not be the actual corporeal entry of the whole body of the burglar; it is sufficient if he merely introduces a part of his body, or even an instrument with which to remove articles from the house. The offence must be committed at night while there is not sufficient light from the sun to distinguish a face. The building entered must be a mansion-house or the outbuildings attached to it, and the dwelling must be one in which persons reside, at least at times. It is not necessary that any one be actually in it at the time, but there must be the *animus revertendi*. A servant in a house who breaks into another room with felonious intent commits burglary; so does a guest at a hotel who breaks into another guest's room with such intent, though he does not if he merely forces his way out of his own room and enters the bar-room or other part of the house to which he has an equal right with others. A distinction exists between such cases and those where the whole house is let out to different families, where the part of the house occupied by each person becomes in a fashion his dwelling-house. It is also a burglary if the house entered, though not a dwelling-house, be an outhouse and parcel of the dwelling-house, not separated by a public road. It was also held in England, and probably the same would hold in America, to be burglary to break and enter a church, as also a walled town. There is a further requisite to the crime, and that is the intent to commit a felony after the intent to break and enter has been accomplished; hence, two intents are required in order to constitute the crime. The crime intended to be committed must be a felony, and not a mere misdemeanor, as an assault and battery. Larceny is very commonly the intent present, but murder, rape, or any other felony will equally constitute the crime. At the common law, the penalty was death, but it was within the benefit of clergy; clergy was, however, taken away later by statute. The punishment in England now is ordinarily transportation or imprisonment, but in cases where there is the aggravation of injury done to a person, death is the penalty. The head has been very much widened by statute in America and in England; thus, burglary may now be committed in many erections other than dwellings and having no connection therewith; or by a similar crime committed in the daytime—or without any breaking—or in the daytime and without breaking. The penalty generally varies with the circumstances of aggravation attending the crime. Some of the States divide the crime into various degrees; thus, the New York code makes three degrees, the first of which is about the same as the common-law offence, only committed in the mansion-house itself, in which there are actual residents at the time, and not in mere outbuildings; the second includes the like offence committed in the daytime, or where the crime is committed at night, but some of the requisites of the first degree are wanting, or where, whether committed by day or night, any of the foregoing requisites are wanting, or where one breaks merely an inner door or one in the house by consent breaks out at night. The third degree may be committed by day or night in any outbuilding or in any store, car, vessel, canal-boat, etc., where valuable things are kept. The penalty in each degree is imprisonment, but for shorter terms in the lower degrees. The details of the laws of the different States on the subject differ very largely, though the cardinal principles of the common law are adhered to.

BURION (Span.), a name applied in the Southwestern United States to the house-finch, *Carpodacus frontalis*, and other species of that genus, family *Fringillidæ*. The male is streaked brown and white, with crimson forehead and breast, and tinged with red in other places; the female much plainer; length six to seven inches. Very abundant and familiar, breeding freely about houses, and highly melodious. (E. C.)

BURLINGAME, ANSON, LL.D. (1820–1870), an American diplomatist, was born at New Berlin, N. Y., Nov. 14, 1820. His father soon after moved with his family to Ohio, and still later to Michigan. He was educated at the University of Michigan, and studied law, graduating from the law-school of Harvard University in 1846. He began to practise in Boston, and soon became a popular orator with the Free-Soil party. In 1852 he became a State senator, and the next year was a member of the State constitutional convention. In 1854 he was elected to Congress by the American party, but soon assisted in forming the Republican party, and took a prominent place in the slavery discussions. Having severely denounced the outrage committed by Preston S. Brooks on Senator Sumner in 1856, he was challenged by Brooks, and accepted the challenge, but the duel never took place. In March, 1861, he was appointed by President Lincoln minister to Austria, but that Government refused to receive Mr. Burlingame on account of his numerous speeches in favor of the independence of Hungary, and he was appointed minister to China, which position he held till 1867, doing much to bring China into amicable relations with the Western nations. When about to return home, Prince Kung, the regent of the empire, appointed him special ambassador to the United States and the leading powers of Europe, an honor never before conferred on a foreigner. Accordingly, Mr. Burlingame returned at the head of a numerous suite in March, 1868, concluded a new treaty in July, and then proceeded for the same purpose to England, France, Denmark, Sweden, Holland, and Prussia, in all of which, except France, he succeeded in effecting important treaties. By these China for the first time secured and accepted the rights, duties, and privileges of a nation under international law. The treaty with the United States also guaranteed to Americans in China and to Chinese in America liberty of conscience and of worship, the right of travel and of residence, and pledged national co-operation in suppressing the coolie trade. Mr. Burlingame had just arrived at St. Petersburg in prosecution of his mission when he was suddenly attacked with pneumonia, and died there, Feb. 23, 1870.

BURLINGTON, the county-seat of Coffey co., Kan., on the Neosho River, 100 miles S. W. of Kansas City, on the Missouri, Kansas, and Texas Railroad, is the terminus of a branch of the Atchison and Santa Fé Railroad. The Nebraska and Memphis Railroad also passes through this place. Burlington has a bank, good schools, seven churches, fine hotels, and two weekly newspapers. A dam across the Neosho River here furnishes power for a large flour mill, a woollen-factory, a glucose-factory, and other works. This was a small Indian trading-post in 1856, and was incorporated as a village in 1862 and as a city in 1871. Population, 2011.

BURMEISTER, Karl Hermann Konrad, a German naturalist, was born at Stralsund, Jan. 15, 1807. After a preliminary course of study in his native town, he went to the University of Greifswald, where he devoted himself to medicine and natural science. Removing afterwards to Halle, he graduated in 1829. After spending a year in Berlin, he entered upon his career as instructor in Joachimsthal, and passed thence to Cologne. In 1837 he was appointed professor of zoology at Halle, and remained there till 1850. During the Revolution of 1848, Burmeister took part in the political strife, and was elected as a delegate to the First Chamber from Liegnitz. His health was injured by his labors in this position, so that he resigned his professorship and sought relief in a voyage to Brazil, where he spent more than a year. After his return he visited Italy, and in 1856 he sailed again to South America, where he spent four years in the Argentine provinces. He then resumed his place as professor at Halle, but in 1861 was called to take charge of the public museum in Buenos Ayres, upon which duty he entered in February, 1862. Under his direction this museum has obtained a high place in the estimation of the scientific world. This was abundantly testified in December, 1879, on the celebration of the fiftieth anniversary of Burmeister's admission to the degree of doctor of philosophy, when complimentary letters from European and American scientific societies and academies were presented to the veteran director. Burmeister's earliest publications were text-books on the natural sciences, and some of these have passed through several editions, as the *Grundriss der Naturgeschichte* and *Geschichte der Schöpfung*. He afterwards published accounts of his travels in South America and works on zoology and physical geography. Among these are—*Systematische Uebersicht der Thiere Brasiliens* (Berlin, 1856); *Anales del Museo Público de Buenos Aires* (1864–74); *Description physique de la République Argentine* (Paris, 1876). His contributions to scientific journals have been numerous and valuable, and his name has been given to a large number of species of animals discovered or described by him. He has been made a member of many American and European scientific societies.

BURNAND, Francis Cowley, an English humorist, editor of *Punch*, was born in 1837. He was educated at Eton and Trinity College, Cambridge, and was admitted to the bar in 1862. His ability as a humorous writer has been displayed in a large number of pieces for the stage, among which the burlesque of *Ixion* was the first to achieve success. His travesty of Douglas Jerrold's *Black-eyed Susan* had a remarkable run of 400 nights in London. Burnand's genuine humor and happy knack of twisting words and notions made him a very acceptable contributor to *Punch*, which for some time had been depending on its draughtsmen to sustain its reputation. He soon became its chief writer, and when the editor, Shirley Brooks, died in 1874, Burnand by the best of right succeeded to the charge of that important censor of British follies and foibles social and political. Even the fact that he had been for some years a sincere Roman Catholic did not prevent the publishers from securing his valuable aid, though twenty years before Richard Doyle had been constrained to leave *Punch* on account of its hostility to his faith. From the pages of that journal in succeeding years several volumes have been gathered which attest Burnand as a worthy successor of Hood. Some of his books are novels sparkling with puns and full of rollicking humor; others are burlesques of various popular novels, books of travel, etc. The most noted is *Happy Thoughts* (1870), which was followed by *More Happy Thoughts* (1871) and *Happy Thought Hall* (1872). Another novel is *My Time, and What I've Done with It* (1874). The burlesques include *A Treble Temptation* (1873); *The Modern Sandford and Merton* (1875); *The Ride to Khiva* (1876); *The Incomplete Angler* (1876); *Strapmore, by Weeder* (1878); *What's the Odds?* (1879); *Gone Wrong* (1881).

BURNETT, Frances Eliza Hodgson, an American novelist, was born in Manchester, England, Nov. 24, 1849. When she was fifteen years old her family removed to Knoxville, Tenn. While yet in her teens she wrote for magazines a number of love-stories, some of which were published in book-form after her later stories had established her reputation. In June, 1872, she made her first contribution to *Scribner's Magazine*, and she has since written regularly for that magazine and its successor, *The Century*. Her most powerful and characteristic work, *That Lass o' Lowrie's*, appeared in 1876. It is a story of a Lancashire mining-town, and shows a thorough acquaintance with its modes of life and a deep sympathy with those engaged in mining. Clearly and strongly is its usual hardening and debasing effect upon character displayed, while in the development of the heroine from a rude pit-girl to a noble type of womanhood we are shown the possibility and means of triumph over surrounding evil. Around this central figure are grouped with artistic skill other characters, well drawn and lifelike, yet subordinate. Throughout the work the author has displayed great dramatic power and a perfect mastery of the Lancashire dialect. The instantaneous and pronounced success of this work caused her to linger in the same field, but her next work, *Haworth's* (1878), though evincing considerable power, is strained and melodramatic. Turning her attention now to the life with which she had become familiar in America, Mrs. Burnett issued *Louisiana* (1880), a story of Western North Carolina. Here she shows again keen insight into character and remarkable power of presenting vigorous thought in a rude dialect. Her later works are *A Fair Barbarian* (1881) and *Through One Administration* (1882). *That Lass o' Lowrie's* has been dramatized, and played both in America and England. Mrs. Burnett has also composed the play of *Esmeralda*, (1881). In Sept., 1873, she was married to Dr. S. M. Burnett, and since 1877 has resided at Washington, D. C.

BURR, Aaron (1756–1836), third Vice-President of the United States, son of the Rev. Aaron Burr (1716–1757), and grandson of the theologian Jonathan Edwards, was born at Newark, N. J., Feb. 6, 1756. Both of his parents dying before he was three years old, he and his sister were brought up in the family of their uncle, Hon. Timothy Edwards of Elizabethtown, N. J. Burr was educated at Princeton College, and after graduating in 1772 spent another year there, then resided for some months in Connecticut with Rev. Dr. Joseph Bellamy, his grandfather's theological successor, and afterwards with his brother-in-law, Tappan Reeve, with whom he began to study law. In April, 1775, receiving news of the battle of Lexington, he hastened to the seat of war near Boston and enlisted as a private. His desire for adventures led him to accompany Arnold on the disastrous expedition to Canada by way of the Kennebec River. Though of delicate constitution, his resolute spirit would not permit him to succumb to the hardships of the winter march, and when they reached Canada, Burr was sent ahead to inform Gen. Montgomery, who had marched from New York, of their approach. Having successfully accomplished his dangerous mission, he was placed on Montgomery's staff with the rank of captain. Eager to distinguish himself, he led a forlorn hope in the unsuccessful assault on Quebec, Dec. 30, 1775, and when Montgomery fell endeavored to bring off his body. Burr's gallant conduct procured his promotion to the rank of major, and on his return in May, 1776, Washington invited him to remain at headquarters, then in New York. In a few weeks Burr was dissatisfied with his position, and left to join the staff of Gen. Putnam, a rough but valiant soldier. By his conduct at this time Burr lost for ever the esteem of Washington, and afterwards affected to despise the military ability of the commander-in-chief. For the rest of the year he was actively employed in operations around New York, and in the next July was made lieutenant-colonel, having the actual command of his regiment. He served till November on the banks of the Hudson, then joined the main army, about to go into winter quarters at Valley Forge. At the battle of Monmouth, June 28, 1778, he commanded a brigade, and by his severe labors and exposure incurred an illness from which he slowly recovered. In the winter he displayed skill and courage in guarding the American lines in Westchester county above New York City, and this duty being found too severe for his strength, he was placed for a short time in command at West Point, but in March, 1779, resigned on account of ill-health. Having resumed the study of law, he was admitted to the bar at Albany in April, 1782. In July of the same year he married Mrs. Theodosia Prevost, the widow of Gen. Augustine Prevost, a British officer.

When the Americans regained possession of New York in Nov., 1783, Burr settled in that city, and, by his skill and talents obtaining extensive practice, was soon living in splendid style at Richmond Hill, a fine mansion in the suburbs. At this time began his professional rivalry with Hamilton, soon to turn into a bitter political strife. Three great and powerful families then divided the political control of the State of New York—the Clintons, the Livingstons, and the Schuylers. Hamilton had by his marriage allied himself with the last, but Burr showed himself desirous of pulling down all three, that he might rise to supreme power on their ruins. In 1784 he was elected a member of the State assembly, and in 1789 was appointed attorney-general of New York. In the great discussion which agitated the State concerning the ratification of the Federal Constitution, he had manifested a contemptuous indifference, but after its adoption he appeared as a candidate of the Anti-Federal party. Around him gathered needy and talented young men who followed his fortunes to make their own, and were sometimes called "Burr's Little Band." By such means his political influence steadily increased, and in 1791 he was chosen United States Senator by the legislature, succeeding Gen. Philip Schuyler, whose aristocratic haughtiness had given offence. When the Senate met, Burr though the youngest member, was made chairman of the committee appointed, according to the custom of the time, to reply to the address of the President. His brilliant talents and charming manners rendered him popular with members of both parties in the Senate, though he always acted with the Republicans, as the Anti-Federalists were now called. Yet the Virginia leaders did not favor him, and when he was strongly recommended for the mission to France, Washington absolutely refused to appoint him.

In 1797 the Federal party seemed to have gained complete control of New York, and Burr, retiring from the national Senate, was obliged to be content with a nomination to the State assembly. Then his peculiar genius for party manipulation was finely displayed, and his adroit management of the campaign regained for his party the position it had lost. Taking advantage of the carelessness of the Federalists in forming their ticket, he secured the nomination of the ablest and most trusted citizens of the State, and shrewdly overcame their respective objections to be candidates. The success at this election assured to his party the great prize of the Presidency in the approaching national contest, and as a reward for his eminent services Burr was placed on the ticket with Jefferson. Both obtained 73 electoral votes, and according to the provision of the Constitution in such emergency it devolved upon the House of Representatives, voting by States, to decide which should be President. Several of Burr's relatives were prominent Federalists, and most of that party in Congress voted for him, though Hamilton used his influence in opposition. Burr kept silence, and seemed willing to take the prize almost within his grasp, even though by so doing he should alienate his own party. After a contest of several days the Federalists of Vermont and Maryland were induced to withhold their votes, and the thirty-sixth ballot showed eight States voting for Jefferson and six for Burr, while two were divided. By his course while the question was in dispute he lost the favor of the Republicans, and by his subsequent action as Vice-President he was considered by the Federalist Senators as ungrateful. Jefferson ignored him in making appointments to office, and in spite of Burr's urgency retained as naval officer in New York a Federalist who was accused of having been a Revolutionary Tory, rather than appoint M. L. Davis, Burr's right-hand man. But in his own State the baffled politician still retained some influence, and being thus forced into opposition announced himself as an independent candidate for the governorship. Most of the Federalists voted for him, but Hamilton was able to prevent his election. Then came the challenge to mortal combat. The ostensible cause was an expression used by Hamilton privately with reference to Burr's unfitness for the office, and though some attempt was made at explanation, the challenger pressed the demand for satisfaction till Hamilton accepted. The duel was fought early on the morning of July 11, 1804, on the west bank of the Hudson, at Weehawken, N. J. Burr, who had practised at a mark for some days previous, took deliberate aim, and Hamilton fell mortally wounded, his pistol being discharged in the air. For ten days after Hamilton's death Burr lingered in New York, and then, finding public opinion becoming more incensed as the duel was publicly discussed, he withdrew to Philadelphia, and thence to Georgia, hoping the breeze would blow over. Meantime, both in New York and in New Jersey efforts were made to have him indicted for murder on the testimony of clergymen who attended Hamilton in his dying hours. When the Senate reassembled in December, Burr was in his place as Vice-President, and afterwards presided at the impeachment of Judge Samuel Chase, who, being accused of making partisan harangues from the bench, narrowly escaped conviction. His strict impartiality at this trial won the approval of the Federalists, and at the close of his term he made an impressive valedictory address and received the usual vote of thanks. Yet he was a ruined man; his house in New York had been sold, but the amount obtained did not suffice to pay his debts, nor could all his property discharge them, and he was therefore liable to imprisonment if he returned.

Homeless and bankrupt, without a hope of retrieving his fortunes in the East, Burr turned to the West, whither adventurers already had begun to resort. The country beyond the Alleghanies was separated from the East by formidable natural barriers, and the inhabitants of the two sections, though of the same origin, were united by but feeble bonds of sentiment. The natural outlet of the West is the Mississippi, but the mouth of this mighty stream, as well as its right bank, had been in the possession of men of other races, who too often showed distrust and hatred of the hardy adventurers settling on the upper part of the stream. During Jefferson's administration the control of the vast province of Louisiana passed from the Spanish to the French, and then by a happy chance to the United States. But some circumstances connected with the first transfer had proved very irritating to the English-speaking settlers, and their feeling of hostility to the Spaniards was not allayed by the second. The emperor Napoleon had purposely left the boundary of the ceded province vaguely defined in the treaty, and a Spanish armed force for a time occupied territory claimed by the United States.

Burr in his first voyage down the Ohio formed the acquaintance of Harman Blennerhassett at his picturesque home on an island in that river, and afterwards readily secured his co-operation in schemes for mutual aggrandizement. The men of the West, not comprehending that Burr had fallen from power, were easily deluded with vague talk of his influence at home and abroad. Some political followers who still adhered to his fortunes thought he might be sent to Congress from Tennessee, but Burr preferred an independent position at the head of affairs in the West. Among the men of local celebrity whom he visited were two who afterwards became prominent in national affairs—Andrew Jackson and Henry Clay. Both were for a time his partisans, and the latter successfully defended Burr when arrested in Kentucky on a vague charge of treason. With these and others Burr discussed various schemes in which he was to be leader. He purchased 400,000 acres on the Washita River, where he projected a colony. He enlisted volunteers for an expedition against the Spanish dons; to some he spoke more boldly of a vast empire in Mexico, and his daughter Theodosia, who accompanied him in some of his journeys, was regarded as its destined empress. Again, he showed the feasibility of forming an independent government in the Mississippi Valley, and it was afterwards testified that he asserted it would be easy for a few determined men to overthrow the Government at Washington. His real purpose probably included all of these ideas except the last, though he left the details to be determined by events as they occurred. In carrying out his plans he was aided by adventurous young men from the East, as well as the hardy pioneers who had already spent years in the Western forests. He had also a promise of assistance from Gen. James Wilkinson, a veteran of the Revolution, weak and vainglorious, but then the senior officer in the United States army and stationed at New Orleans. A correspondence in cipher was carried on between them, and, though Wilkinson subsequently asserted that he had never given countenance to anything treasonable, the letters indicate that he was an accomplice. Money was advanced by Blennerhassett and others, boats were built at Marietta, Ohio, military stores and provisions were gathered at Blennerhassett's Island, which was made the rendezvous, while Burr travelled through Kentucky and Tennessee summoning volunteers.

The reports from the West alarmed Jefferson, whose strong prejudice against Burr had grown into a bitter hatred. At last, Wilkinson, after balancing the probabilities between his assured position as the commander of the American army and the uncertain result of a campaign under a leader more distinguished in politics than in war, concluded to lay before the President the contents of the last letter which he had received from Burr, declaring that this had opened his eyes to the real meaning of the proposed expedition against the Spaniards. Jefferson immediately issued a proclamation (Nov. 27, 1806) warning the people of the West to withdraw from unlawful enterprises, and commanding all officers to bring the offenders to condign punishment. At his suggestion, Gov. Tiffin of Ohio sent militia who seized the boats and stores at the rendezvous, while Blennerhassett with a few companions escaped down the river, joining Burr at the mouth of the Cumberland. The whole party numbered about sixty or eighty men, and their leader still kept them in ignorance of his ultimate designs; but when he approached Natchez, finding that Wilkinson was now determined to oppose him, the expedition was forthwith disbanded. When he was arrested in Mississippi Territory a grand jury ignored the bill, but he felt a risk in remaining, and with a few comrades attempted to make his way in disguise to Florida. He was recognized, however, at Fort Stoddard in Alabama, and arrested by Capt. Gaines, who sent him under guard to Virginia.

Arriving at Richmond March 26, 1807, he was brought before Chief-Justice Marshall, and after three days' examination was admitted to bail on a charge of misdemeanor. The next session of the United States circuit court, composed of the chief-justice and Judge Cyrus Griffin, opened May 22, but the grand jury waited a month longer to get the testimony of Gen. Wilkinson, and then brought in indictments for treason as well as for misdemeanor against both Burr and Blennerhassett, who had been arrested in Kentucky. The accused were now committed to prison, and the trials began August 3. The prosecuting attorney was George Hay, and among his assistants was the more distinguished William Wirt, whose speech on this occasion is still famous in the annals of American oratory. The defence was conducted by Burr himself, assisted by Edmund Randolph and other able lawyers of Richmond, as well as Luther Martin, a distinguished Federalist of Maryland. Washington Irving, then a young lawyer of twenty-five, who had contributed to a New York paper established by Burr's friends, was also retained for the defence, but took no public part. Jefferson did not remain passive, but by frequent letters from Washington directed the prosecution, laboring to secure Burr's conviction as a vindication of himself. To his vexation, however, the first trial collapsed (Aug. 31) on the ruling of the chief-justice that no overt act of treason had been proved, as is required by the Constitution. The trial for misdemeanor was then spun out till the end of October, and at last a verdict of acquittal was rendered on the ground that the offence charged had taken place in Ohio, outside of the constitutional jurisdiction of the court. Burr was then held to bail for trial in Ohio, but the prosecution never was renewed.

After the acquittal he went to Baltimore, but soon found it prudent to retire from public view. In June, 1808, he sailed to England under an assumed name, and there made vain efforts to secure the aid of European Governments in establishing an empire in Mexico. In April, 1809, he was placed under arrest by the British Government, but soon after was permitted to go to Sweden. After some months of aimless wandering in Sweden, Denmark, and Germany, he finally went to Paris to lay his schemes before Napoleon. But he found it impossible to reach the emperor, and more difficult to leave France than to enter it. After a stay of fifteen months he secured a passport and sailed from Amsterdam, but had hardly got to sea when the vessel was overhauled by a British frigate and carried into Yarmouth. He went immediately to London, where he lived unmolested, but in extreme poverty, for five months. With great difficulty he succeeded in finding a captain willing to take him as a passenger, and finally arrived penniless in Boston early in May, 1812. By selling his copy of Bayle to Harvard College he obtained the means of reaching New York. Here he resumed his profession, shunned by many, oppressed with debt, yet able by his well-known technical skill to secure some practice.

His beautiful and accomplished daughter, Theodosia, whom he had carefully trained with remarkable devotion, had been married in 1800 to Joseph Alston, a wealthy planter of South Carolina, who afterwards became governor of that State. In June, 1812, her son, an only child, in whom Burr had taken great interest, died, and on December 30 she set sail to the North to meet her father, but the vessel in which she embarked was lost at sea. Thus "separated from mankind," as he once expressed his condition, he lived a solitary, Spartan life, but conversed freely at times about his past adventures. He is said to have been the first to suggest the nomination of his old friend, Gen. Jackson, for the Presidency, with the purpose of breaking down the Virginia domination that had so long prevailed in the Government, and of which he was a conspicuous victim.

To extreme old age he delighted to exercise his powers of fascination on women. At the age of seventy-seven he was privately married to Madame Jumel, a native of New England and the widow of a wealthy planter of San Domingo, who, having escaped the massacre on that island, had become a successful merchant in New York. The widow, having employed Burr as a lawyer, was drawn on to accept him as a husband, but afterwards her determination still to control her property led to their separation. Yet after his first paralytic stroke he was taken at her request to her home, but on recovering resumed his solitary habits. After a second stroke he was taken to the boarding-house of Mrs. Joshua Webb, and in the summer of 1836 was removed to a small hotel at Port Richmond, Staten Island, opposite New York. Here he died, Sept. 14, 1836. His last word was "Madame." Though he had been reduced to extreme poverty, he left a will under which eventually an illegitimate daughter succeeded to some property.

Burr was below medium height, yet well proportioned and of fine personal appearance, with remarkably piercing and brilliant eyes. He was graceful in manner, and possessed fine conversational powers, though always reticent with regard to himself. It is said that while a student at Princeton he was affected by a revival of religion, and asked the advice of the president, Rev. Dr. Witherspoon. The hard-headed Scotchman, not appreciating the character of the youth, warned him to beware of fanaticism, and Burr dismissed the subject from his thoughts. In active life he was a striking exemplar of the maxims of Lord Chesterfield and a signal instance of their practical failure. However attractive he appeared at first, one after another of those brought in contact with him detected the hollowness and sham of his moral character, and henceforth distrusted him, until at last this distrust became universal. Yet at no time was his course changed in consequence of the public estimation. To him war, law, politics, life itself, were games of mingled skill and chance. He played each with the close attention and external indifference of a professional gambler. In each he displayed considerable ability and attained some success, yet in the end miserably failed in all. He bore his losses with the same stoicism he had displayed when at the point of triumph. The most damaging estimate of his moral character, and especially of his relations with women, has been presented by his personal friend and literary executor, Matthew L. Davis, and, though Mr. Parton has palliated some of the charges, enough remains to condemn Burr as an unprincipled libertine.

His great conspiracy, baffled and crushed ere it had clearly displayed its purpose and character, remains still a problem for the historian. Some of its aspects are indicated in the foregoing narrative. The idea of an empire in the New World undoubtedly seemed practicable to Burr, whose ambition was dazzled by the contemporaneous career of Napoleon I. in Europe. The character and intellect of the American were fitted for attempting such a career, though he lacked the genius and the field to attain even such transient success as the French emperor enjoyed. Happily for the United States, by a natural reaction the failure of his attempt established on a firm basis the union of the Atlantic States with those of the Mississippi Valley, and deferred for half a century any serious attempt to divide the country.

A *Life of Aaron Burr* was published by Samuel L. Knapp in 1835, but the principal biographies are the *Memoirs of Aaron Burr, with Selections from his Correspondence* (2 vols., 1837–38), by Matthew L. Davis, who also edited his *Private Correspondence* (1838); and especially *The Life and Times of Aaron Burr*, by James Parton (1st ed. 1858; enlarged ed. 1864). (J. P. L.)

BURRITT, Elihu (1810–1879), an American author and social reformer, was born at New Britain, Conn., Dec. 8, 1810. He received only a common-school education, and at the age of sixteen was apprenticed to a blacksmith. He became expert in the use of tools of all kinds, and having a strong desire for reading, acquired considerable knowledge of English literature. When twenty-one years old he pursued a short course of mathematics, and then resolved to read the ancient languages. By working diligently in the spring and summer he was able to devote to this object the greater part of the winter, which he spent in New Haven in sight of Yale College, though without assistance from it. His success in what he first proposed led him to make further acquisitions, so that he became proficient in reading not only the ancient languages, but also most of those of modern Europe. In order to obtain access to foreign books, he removed to Worcester in 1844, where he used the library of the Antiquarian Society. A letter giving an account of his studies was brought to the notice of Gov. Edward Everett, and by him read at a State convention of teachers. Burritt was thenceforth known as "the learned blacksmith." He also delivered public lectures advocating temperance, the abolition of slavery, and especially the abolition of war. To further these views he established in 1844 a paper called *The Christian Citizen*. He also started what he called "The Olive-Leaf Mission," sending to newspapers a brief printed tract advocating peace, in the hope that it would be inserted in their columns. This mission was highly successful from the first, and after a time a thousand copies were sent out to as many newspapers in all parts of the Union. In June, 1846, he went to Europe, expecting to stay only three months, but he found a new field of labor in trying to establish "The League of Universal Brotherhood." He travelled through Great Britain lecturing on this theme and forming associations. As an outgrowth of this movement, he began in 1847 to advocate ocean penny postage for the promotion of friendly intercourse among nations. The agitation which ensued eventually accomplished its object. During the famine in Ireland, Mr. Burritt visited that country, and by his reports induced many Americans to contribute for the relief of its distress. In 1848, under his guidance, the first International Peace Congress was held at Brussels, Sept. 20. The second was held in Paris the next year, under the presidency of Victor Hugo. Returning to the United States in 1850, Mr. Burritt was received with great enthusiasm, and started on a lecture-tour through the principal cities. After attending the next Peace Congress at Frankfort-on-the-Main, Aug. 23, 1850, he renewed his labors in England and extended the Olive-Leaf Mission on the continent of Europe. He returned to the United States at various times, and lectured through the country. In 1856, on account of the threatening aspect of the slavery question, he advocated a scheme for compensated emancipation, and organized a company for this purpose; but, though he labored earnestly, the movement was unsuccessful. He was strongly opposed to slavery, but his love of peace and the failure of his plan caused him to look with little favor on the war for the Union. He lived in retirement on his farm at his birthplace until 1863, when he returned to Great Britain to accomplish a long-cherished plan of travelling on foot throughout the country. These travels are well set forth in his two volumes, *From London to John O'Groat's* and *From London to Land's End*. To these he soon added *Walks in the Black Country* (1866). In 1865 he was appointed United States consular agent at Birmingham, and used his official position to promote systematic emigration from the overcrowded districts of England and Scotland to America. Returning to his native place at the close of his term in 1868, he thenceforth lived on his farm, busily engaged in writing, and laboring especially for the welfare of his neighborhood. In 1872 the honorary degree of A. M. was conferred on him by Yale College. He died at New Britain, Conn., March 7, 1879. Besides his books of travels already mentioned, his principal books are *Sparks from the Anvil* (1847, 1864), *Thoughts and Things at Home and Abroad* (1854), *Mission of Great Suffering* (1867), *Chips from Many Blocks* (1878). Charles Northend has edited *The Life and Labors of Elihu Burritt* (1879).

BURROUGHS, John, an American essayist, was born at Roxbury, Delaware co., N. Y., April 3, 1837. After receiving an academical education he began to teach in a common school at the age of seventeen. He married before he was twenty-one, and afterwards removed to New York, where he drifted into journalism. In 1863 he received an appointment in the Treasury Department at Washington, and became chief of the organization division in the bureau of national banks. In 1871 he visited Europe on important business for the Treasury Department, and again in 1882 he spent several months abroad. He has been since 1873 an examiner of the national banks, and this position affords him abundant leisure for his favorite tramps in woods and fields. He has contributed to the leading American magazines, and many of his essays have been collected in book-form. His first separate publication was *Notes on Walt Whitman as Poet and Person* (1867), but his later collections have consisted of observations on the various aspects of nature in America and England. He is a keen and original observer, with a hearty enthusiasm for uncultivated nature, and his racy, idiomatic style tends to create a similar enthusiasm in his readers. The titles of his books are generally taken from the leading essay; they are *Wake-Robin* (1870), *Winter Sunshine* (1873), *Birds and Poets* (1875), *Locusts and Wild Honey* (1878), *Pepacton* (1881).

BURTON, John Hill, LL.D., D.C.L. (1809–1881), an eminent Scotch historian and essayist, was born at Aberdeen, Aug. 22, 1809. His father, during the apprehension of an invasion of Britain by Napoleon, had gone as a lieutenant in a London volunteer company as far north as Aberdeen, and there married Miss Eliza Paton. His son showed ability by gaining a bursary in Marischal College by competition before he had completed his grammar-school course. The mother from her scanty means helped him through college, and his only recreation was taking long rambles on foot in various parts of Scotland. After completing his classical course he began to study law, and when he determined to enter the higher walks of that profession his mother sold a little house she had built and removed to humble quarters in Edinburgh. Here, besides studying civil law, he attended various classes in the university and commenced his literary career. From early youth he had been fond of writing and had contributed to local periodicals; he now assisted in preparing school-books and various compilations. Though he was admitted to the Scotch bar as an advocate in 1831, he found little employment in his profession, and soon all his time was absorbed in authorship. He wrote for the *Westminster Review*, and afterwards for the *Edinburgh Review*, on law, history, and political economy. His first work of special importance was *The Life and Correspondence of David Hume* (1846) which was followed by the *Lives of Lord Lovat and Duncan Forbes* (1846). He was associated with Dr. John Bowring in editing Jeremy Bentham's literary remains, and published an introductory work called *Benthamiana* (1848). A little practical treatise on *Political and Social Economy* was the work of a few days in 1849, when he was also editor of the *Scotsman*. At this time he suffered a heavy blow in the loss of his wife, with whom he had spent five happy years. Henceforth to a great extent he shunned general society, and devoted himself still more closely to authorship, contributing frequently to *Blackwood's Magazine*. His legal training had fitted him for preparing a *Manual of the Law of Scotland* (1852) and a *Treatise on the Law of Bankruptcy of Scotland* (1852). In the same year appeared his *Narratives from the Criminal Trials of Scotland*, and in the next a more important volume, which eventually proved to be the first instalment of the work on which his fame rests. This was *The History of Scotland from the Revolution to the Extinction of the Last Jacobite Insurrection* (1853). A change now took place in his fortunes; hitherto he had been obliged to maintain himself by literary toil, but being appointed secretary of the prison-board in 1854, he was relieved of this necessity. He removed to a country residence near Edinburgh, where his official work was chiefly carried on, and in the next year he was married to Katharine, daughter of Cosmo Innes, whose house had been a favorite resort since he lost his relish for society. Determining to complete the history of his native land, he returned, after his day's work at his office in town, to spend most of the night in historical research and literary labor. When the principal part of the duty connected with the Scotch prisons was transferred to London, Dr. Burton was retained as manager, with but little change in his work. Steadily his self-imposed labors advanced, and the results were at last seen in the seven volumes of the *History of Scotland from Agricola's Invasion to the Revolution of 1688* (1867–70), while the volume published previously brings the full work down to 1745. As a relief from the serious toil of these fifteen years he published some lighter articles in *Blackwood*, which were afterwards collected in book-form, and may be regarded as most characteristic of the man. They are *The Book-Hunter* and *The Scot Abroad* (1864). In 1867 he was made historiographer royal of Scotland, an honor which was enhanced by being tendered by a Conservative ministry to one who had been a steady Liberal. In 1868 he was appointed to collect for Parliament the annual judicial statistics of Scotland. As soon as the *History of Scotland* was finished Dr. Burton took up the reign of Queen Anne as a subject interesting in itself and familiar from its connection with his previous studies. In 1878 he was obliged to leave Craighouse, and took Morton, a place two miles farther out of town. Old age was now creeping upon him, and, though his office-work was diminished, his power of steady application, for which he had been noted, declined. His circle of old friends was reduced to Prof. Blackie and Dr. John Brown, both noble representatives of genuine Scottish character. In 1879, Dr. Burton made his last visit to the Continent, where he had been accustomed to spend a few weeks in summer. His *Reign of Queen Anne* appeared in 1880, and then, his work being done, he sold his library, pleading in reply to the remonstrances of his friends that it had been gathered for use, not for show, and that its size prevented his living in a smaller house. He died Aug. 10, 1881, after a brief illness. Throughout life he was noted for energy and persistency, and is said to have been irritable. His chief mental defect was a want of imagination, so that while a keen observer he was unable to enter fully into the feelings of others. His labors as an historian were highly acknowledged at home and abroad. He received the degree of LL.D. from the University of Edinburgh, and that of D.C.L. from the University of Oxford in 1878. Since his death a new edition of his *Book-Hunter* has been published (1882), with a judicious and affectionate memoir by his widow.

BURTON, Richard Francis, a distinguished English explorer and author, was born at Barham House, Hertfordshire, March 19, 1821. He is the son of Lieut.-Col. Joseph N. Burton, and in his youth spent several years in France and Italy. He entered Oxford in 1840, being then destined for the Church, but soon his taste for an adventurous life led him to accept a commission as lieutenant in the Indian army.

In 1844 he went to Sind with his regiment, and was on the staff of Sir Charles J. Napier, who employed him for five years in the Sind canal survey. He had then become well versed in Arabic, Persian, and other Oriental languages, and frequently ventured in the disguise of a dervish among the wild tribes. He also labored as a native among those employed in making the canal, and thus frequently obtained valuable information. After seven years thus spent in hard study and strange adventure besides his professional duties, he returned to England on account of an attack of ophthalmia from overwork. He now ventured into the field of authorship, giving in his first volume, *Goa and the Blue Mountains* (London, 1851), an account of an excursion to the Neilgherry Hills. In the same year he published *Scinde, or, The Unhappy Valley*, and *Sindh, or, The Races that Inhabit the Valley of the Indus.*

In April, 1853, under patronage of the Royal Geographical Society, Burton entered upon the most romantic part of his career. This was an attempt to penetrate Arabia in disguise, so as to study the inner life of the Moslem. His previous training in the Sind, his accurate knowledge of Eastern languages, manners, and religions, and his Arab head and face, abundantly qualified Burton for this enterprise. Such was the perfection of his disguise in every respect that his true character was never suspected, and his *Pilgrimage to Meccah and El-Medinah* (1855) gave the first account of these places published since the time of Burckhardt, who visited them in 1814. Returning to Egypt, he went to Bombay, where he organized an expedition into Somali Land, East Africa, with the special object of visiting Harar, in Moslem Abyssinia. Disguised as an Arab, he succeeded in reaching this city, and returned to Aden with the first authentic account of it, but the expedition, in which he was accompanied by Lieut. (afterwards Capt.) Speke and two other officers, terminated disastrously. The natives at Berberah made a night-attack on the explorers, in which Burton and Speke were severely wounded and another officer was killed. Burton was obliged to return to England, where he published *First Footsteps in East Africa* (1856). He then went to the Crimea, where he was appointed chief of staff to Gen. Beatson and organized the Osmanli irregular cavalry, which, however, on account of the close of the war, was not brought into action. Turning again to Africa, he proposed to explore the lake regions of the centre. Accompanied by his former associate, Capt. Speke, he landed at Zanzibar Dec. 19, 1856, and soon made a preliminary exploration to the regions about Mombas. The two succeeding years were spent in journeys and adventures, described in his *Lake Regions of Equatorial Africa* (1860). This was the first successful attempt to penetrate that country, and in it the foundation was laid for the subsequent labors of Livingstone, Cameron, Stanley, and others. During these explorations Capt. Burton suffered severely from the effects of the climate, and while he was prostrated with fever Capt. Speke pushed on and discovered the large lake since known as the Victoria Nyanza.

In 1862, Burton was appointed consul at Biafra, West Africa, with a jurisdiction of 600 miles in extent. He took up his residence in the island of Fernando Po, 20 miles from the mainland, as a centre for the thorough exploration of the coast from Bathurst, in Gambia to São Paulo de Loanda, in Angola. He ascended the Cameroon Mountains, and in 1863 published *Abeókuta, or, An Exploration of the Cameroon Mountains.* In the same year he went upon the delicate and dangerous mission—occupying three months—to Gelele, king of Dahomey, to prevail upon him to abolish the "customs"—*i. e.*, the annual festival in the autumn during which many human victims were put to death with attendant ceremonies of great barbarity. This journey was chronicled in his *Mission to the King of Dahomey* (1864).

Burton was then transferred to the consulship of Santos in Brazil, which he held for four years, finding abundant opportunity to gratify his love of adventure. His work on the *Highlands of Brazil* (1868) contains full accounts of the gold and diamond districts, as well as of his canoe-voyage of 1500 miles down the river São Francisco. Being ordered to report to the British Government the state of Paraguay, he visited that country, then crossed the Pampas and the Andes to Chili, travelled along the Pacific coast, and finally returned by the Straits of Magellan. On arriving at London in 1868 he was appointed consul at Damascus, where he had great influence with the Arab tribes. He travelled through Syria, and added to his publications a volume on *Unexplored Syria* (1872). In the same year appeared a volume which he had prepared long before, on *Zanzibar: City, Island, and Coast.* His visit to Iceland in the summer of 1872 is recorded in *Ultima Thule.* On his return he found himself appointed consul at Trieste, and has since held that position, though making various journeys and voyages at intervals. One of these was to Sind, in which he had commenced his adventurous career; another was to North-western Arabia. These furnished the subject of two volumes, *Sind Revisited* (1877) and *The Gold-Mines of Midian* (1878). His second expedition to Midian, organized under the patronage of the khedive of Egypt brought back great treasures, ethnological, anthropological, and geological, coins, inscriptions, maps, plans, and photographs of thirty-two ruined cities, and twenty-five tons of minerals for analysis. His last expedition has been to the Gold Coast of West Africa. His most recent literary work (1882) is a biography of the Portuguese poet Camoens, with a full commentary on his great epic, *The Lusiad.*

Capt. Burton has published altogether nearly fifty volumes, chiefly accounts of his travels. He is expert as a swordsman, hunter, and shot, and is said to have mastered twenty-nine languages besides several dialects.

BUSCH, JULIUS HERMANN MORITZ, a German author, was born in Dresden in 1821. After studying theology, and then philosophy, at Leipsic, he devoted himself to journalism, became familiar with English literature, and translated several works of Dickens and Thackeray into German. The years from 1848 to 1851 were a turning-point in his life, and directed his attention to the political problems of the period. At that time he held republican convictions, and as the events of 1850 were discouraging in this respect, as well as dampening the hopes of a unification of Germany, he concluded to emigrate to the United States, with a view of settling down as a farmer. He went in 1851, extended his journey through a large part of the Atlantic and Western States, and made a more protracted stay in Ohio and Missouri. As he found himself disappointed in the ideals he had cherished, he returned to his native land in the spring of 1852. In the next year he gave an account of his observations and experiences in a book called *Wanderings between the Hudson and the Mississippi.*

Subsequently he undertook several other extensive journeys; he spent some time in Sleswick-Holstein, to inform himself by his own observation of the condition of the country under Danish rule; between 1856 and 1859 he three times visited the East, inclusive of Egypt and Nubia. The literary outcome of these years of travel were *Schleswig-Holsteinische Briefe* ("Letters on Sleswick-Holstein"), *Bilder aus dem Orient* ("Pictures from the East"), and *Eine Wallfahrt nach Jerusalem: Bilder ohne Heiligenscheine* ("A Pilgrimage to Jerusalem: Pictures without Glories"). In these writings Busch shows himself identified with the realistic school. In his politics he now began to side with the Gotha fraction. After 1856 he contributed, with Gustav Freytag and Julian Schmidt, to the literary and political weekly *Grenzboten*, the editorship of which devolved upon him from 1859 till the outbreak of the Sleswick-Holstein war. In 1864 he entered the service of Duke Frederick von Augustenburg, whose interests he advocated in Kiel by his pen. When, in 1865, he became convinced that he was no longer in his place, as the duke declined to make even the most necessary concessions to the requirements of nationality, he took his leave and returned to Leipsic, his former place of residence, where he resumed the editorship of the *Grenzboten.* Soon afterwards he went, at the call of the Government, to Hanover, where he assisted the civil commissioner Von Hardenberg as manager of the press that represented the policy of the Government. His experience at that time has been recorded in *Das Uebergangsjahr in Hannover* ("The Transition Year of Hanover"). In the fall of 1867 he repaired again to Leipsic, and used his pen in the vindication of the new order of things in Germany. Besides, he wrote (following Lenormant) *Urgeschichte des Orients* ("Earliest History of the East"), and from documents collected in America a *History of the Mormons.* In February, 1870, he received an appointment in the foreign office at Berlin for the end of discussing and advocating in the public press the ideas and aims of the chancellor, with whom he had close relations. He accompanied Bismarck in the French campaign, retained his position after returning with him from Versailles till March, 1873, and continues in connection with the chancellor to the present time. Having again spent two years in Hanover and some time in Leipsic, writing political papers for the *Grenzboten* and some works touching upon the history of culture—viz. *Deutscher Volkshumor* ("Humor of the People in Germany"), *Deutscher Volksglaube* ("German Popular Notions"), *Die gute alte Zeit* ("Good Old Times"), also translations of some writings of Mark Twain, Bret Harte, Aldrich, and Artemus Ward, under the title *Amerikanische Humoristen und Novelisten*—he published in the fall of 1878 a part of his diary kept during the French campaign, under the title *Count Bismarck and his People* (Leipsic, Grunow), after submitting the manuscript to the chancellor and amending it according to his suggestions. It made a great stir everywhere, and ran within six months through five large editions; besides, it appeared in seven translations (two American, one English, one French, one Dutch, one Swedish, one Russian). The general impression was, that the book is based on strict adherence to fact, and exact, minute observation. Soon after the publication of this work Mr. Busch again took up his residence in Berlin, where his free intercourse with the chancellor gave him an opportunity to serve the latter with contributions to the press, which, on account of the important questions they discussed and the authentic source from which they were known to emanate, received general attention. It is no secret that Mr. Busch has completed a diary which covers the whole time of his dealings with Bismarck, and fills up many gaps left in the publication of 1878.

BUSHNELL, a city of McDonough co., Ill., is at the junction of the Quincy branch and the St. Louis division of the Chicago, Burlington, and Quincy Railroad. It is also on the Wabash, St. Louis, and Pacific Railroad. It has three hotels, a national bank, two weekly newspapers, six churches, two schools, and the Western Normal College. The industries comprise a flour-mill, a foundry, a canning-factory, and manufactures of pumps, ploughs, tiles, pottery, bricks, and cigars. It was settled in 1852, and incorporated as a city in 1877. Population, 2316.

BUTCHER-BIRD. See SHRIKE.

BUTLER, the county-seat of Bates co., Mo., is 75 miles S. E. of Kansas City, on a branch of the Missouri Pacific Railroad. It has a court-house, opera-house, four hotels, two national banks, two daily and four weekly newspapers, six churches, eight schools, and an academy. It has a saw-mill, three flour-mills, a woollen-factory, and a carriage-factory. It has a park, and is lighted with the electric light. It was settled about 1850, but being destroyed during the Civil War it was re-settled in 1865. There are coal-mines in the vicinity, and large quantities of coal are shipped daily. Population, chiefly of American birth, 2162.

BUTLER, the county-seat of Butler co., Pa., is on the Conequenessing Creek, 33 miles N. of Pittsburg, with which it is connected by a branch of the Pennsylvania Railroad and by the New York, Pittsburg, and Chicago Railroad. It is also a terminus of the Karns City and Butler Railroad. It has three banks (one national), seven churches, graded schools, three flour-mills, three planing-mills, woollen-mills, stave-factory, tannery, and glass-works. The town was laid out in 1803. Population, 3163.

BUTLER, BENJAMIN FRANKLIN, an American lawyer, general, and politician, was born at Deerfield, N. H., Nov. 5, 1818. His father, Capt. John Butler, who had served under Gen. Jackson at New Orleans, died while Benjamin was an infant, and his mother soon after removed to Lowell, Mass. He graduated at Waterville College, Maine, in 1838; studied law, and was admitted to the bar at Lowell, Mass., in 1840. He became noted as a criminal lawyer and also for his advocacy of the rights of the working classes. In politics he was an active Democrat, and attended the national conventions of his party from 1844 to 1860. In 1853 he was elected to the Massachusetts legislature, and was a member of the State constitutional convention. In 1859 he was elected to the State senate, and previous to the Civil War he was twice a candidate for the governorship of Massachusetts. In the Democratic national convention at Charleston, S. C., in May, 1860, he unsuccessfully endeavored to secure a simple reaffirmation of the platform adopted at Cincinnati in 1856. He also strongly opposed the nomination of S. A. Douglas as certain to divide the party, and steadily voted for Jefferson Davis as the Presidential nominee. At the adjourned convention held in Baltimore, June 18, he took part in the proceedings until there was a second secession of Southern men on account of the admission of Douglas delegates to the vacant seats. Butler then, with a majority of the Massachusetts delegation, retired, on the ground that there had been "a withdrawal in part of a majority of the States." While he voted for Breckenridge for President, he was earnestly in favor of the preservation of the Union, and forewarned Pres. Buchanan and Gov. Andrew of Massachusetts of the designs of the Southern leaders. He had always taken an active interest in the State militia, and on the outbreak of the Civil War was a brigadier-general. When Pres. Lincoln, on April 15, 1861, issued a call to the States for troops for the defence of Washington, Gen. Butler ordered the regiments of his brigade immediately into active service. On April 16 the Sixth regiment left Boston, and two days later Gen. Butler followed with the Eighth, while two other of his regiments proceeded by sea to Fortress Monroe. Finding the approach to Baltimore obstructed, Gen. Butler passed down the Chesapeake to Annapolis and restored communication with Washington. A few weeks later he quietly took possession of Baltimore, and May 16 was appointed by the President a major-general of volunteers and placed in command of the department of Virginia with headquarters at Fortress Monroe. Here he was at once confronted with the problem of the disposal of the runaway slaves of Secessionists, and solved it by declaring that slaves as property were "contraband of war." In February, 1862, he was placed in command of the military part of the expedition which sailed to Ship Island in order to operate against New Orleans. After Farragut had successfully passed the forts on the Mississippi defending the approach to that city, Gen. Butler took possession of it on May 1, 1862. By his firmness, ingenuity, and administrative ability he preserved order and public health in a city noted for its hostility to the defenders of the Union and its liability to dangerous epidemics. Even his famous "woman order," which was widely misinterpreted and denounced, secured its object by its mere publication. In December, 1862, he was succeeded in command of the department by Gen. N. P. Banks. In November, 1863, Gen. Butler was appointed to the command of the department of Virginia and North Carolina, and formed a plan for the capture of Richmond by operations from the south side of the James. On May 5, 1864, with the Army of the James he occupied City Point and Bermuda Hundred, and intrenched himself there in order to co-operate with the Army of the Potomac, then approaching from the north. But Gen. Beauregard, who was summoned from Charleston, checked his advance, and a few days later most of his troops were transferred to the Army of the Potomac. In the following November he was on duty in New York City suppressing anti-draft riots, and was afterwards sent on an expedition against Fort Fisher in North Carolina, but returned without success, and soon after was relieved of his command. In 1866 he was elected to Congress, where he took a prominent part in the measures proposed for the reconstruction of the Southern States, and was urgent for the impeachment of Pres. Johnson. He also advocated the payment of the national bonds in legal tenders whenever gold was not specified in the bond. He continued to represent his district in Congress till 1878, though there was growing dissatisfaction among the Republicans with his course on financial and other questions. In 1878 he was nominated for governor of Massachusetts by an independent Democratic convention, but was defeated. In subsequent years he received the regular Democratic nomination, although he did not declare his return to the Democratic party until 1880. Finally, in November, 1882, he was elected to the position of governor, which he had long sought.

BUTLER, Elizabeth Southerden, an English artist, was born in Lausanne, Switzerland, in 1844. Her maiden name was Thompson. She studied at South Kensington. She first exhibited at the Royal Academy in 1873, her picture that year being entitled Missing. The following year she sent to the Royal Academy The Roll-Call. This work was the great success of the exhibition, and established the artist's reputation. It was purchased by the queen. Subsequently she painted The Twenty-eighth Regiment at Quatre-Bras, Balaklava, The Return from Inkerman, The Magnificat, 'Listed for the Connaught Rangers, On Duty, The Scots Grays advancing, Cavalry at a Gallop, and other works mainly describing incidents of military life. Mrs. Butler's works have been extravagantly praised and almost as extravagantly censured. She is an artist of very great ability, and her faults are evidently to a large extent due to a lack of training. Her drawing is faulty and her composition lacks unity, but, on the other hand, her characterization is almost always excellent, and not only does she deal adequately with incident, but as a rule her subjects as wholes are treated with fire and force.

BUTT, Isaac (1813–1879), an Irish lawyer and politician, the originator of the Home Rule movement, was born at Glenfin, county Donegal, in 1813. His father was the Episcopalian clergyman of that place, and the family claimed descent from the O'Donnells, the ancient Irish chiefs of Tyrconnell. Isaac graduated at Trinity College, Dublin, in 1832 with high classical and mathematical honors, and in 1836 was appointed Whately professor of political economy in that college. While an undergraduate he had assisted in founding the *Dublin University Magazine*, and was for some time its editor. In 1838 he was called to the bar, and in 1840 appeared before the House of Lords as counsel for the corporation of Dublin against the Irish Corporation Reform Act. As an able and eloquent representative of the Protestant conservative party he was chosen an alderman of Dublin, that he might oppose in the corporation Alderman Daniel O'Connell, then agitating for a repeal of the Union. In 1844 he became queen's counsel, and took a leading part in all the great trials, civil and political, in Ireland for twenty-five years. He appeared in defence of W. Smith O'Brien and others when tried for treason in 1848. His eloquence and conservatism caused him to be invited to England to speak in advocacy of protection, and in May, 1852, he was elected to Parliament from the borough of Harwich, England. In the same year he was elected as a Liberal Conservative from Youghal, Ireland, but during the thirteen years he held this position his opinions gradually changed and he became a supporter of Lord Palmerston. In 1864 he was called to take charge of an important mercantile case in Ireland, and did not return to Parliament. He was next engaged in defence of some Fenian prisoners, and for four years devoted himself disinterestedly and assiduously to the task, in which he was finally successful. His generous labors in their behalf won for him the confidence of the Irish people. The disestablishment of the Irish Church having been effected, a meeting of the representatives of all classes of Irishmen was held in Dublin, May 19, 1870, to consider the needs of their country and their present duty. Mr. Butt's address on this occasion, unanimously endorsed by the assembly, was the foundation of the Home Rule movement. He asked for an Irish Parliament to have the management of its local affairs, while leaving to the imperial Parliament complete control of imperial interests. On this basis he was elected to Parliament from Limerick in 1871, and became the leader of the Home Rule members. The movement spread rapidly among the Irish people, and Nov. 18, 1873, a more effective organization was formed under the name of the Irish Home Rule League. In the following February, though taken by surprise by the sudden dissolution of Parliament, they elected fifty-seven members favorable to Home Rule. Under the leadership of Mr. Butt they presented to the House of Commons schemes of practical legislation for the amelioration of the Irish people. His own programme of Land Reform he summed up in the three Fs—Fixity of Tenure, Fair Rent, and Free Sale. Mr. Butt, however, opposed the policy of obstruction which more ardent Home Rulers were beginning to employ. In 1877 he left Parliament on this account, but returned in the following session, when the dissensions in his party had been somewhat harmonized. On account of failing health he did not resume his place as leader, though he spoke in advocacy of intermediate education and other measures for the benefit of Ireland. He died in Dublin, May 5, 1879. Some of his early contributions to the *Dublin University Magazine* were made under the name of "Edward Stevenson O'Brien." and have been published separately. He afterwards published some lectures on political economy, a *History of the Kingdom of Italy* (1860), various pamphlets on Irish questions, and a *Practical Treatise on the Law of Compensation to Tenants in Ireland* (1871).

BUTTE CITY, the county-seat of Silver Bow co., Mont., is 65 miles S. of Helena and 450 miles N. of Ogden, Utah, on the Utah and Northern Railroad. It has four hotels, three banks (one national), two daily and two weekly newspapers, six churches, and a graded school. The business of the town is directly connected with silver-mining. There are two foundries, two ore-concentrators, and several silver quartz-mills and smelters. The city is on the southern slope of a mountain 5600 feet above the sea-level. A placer-mining camp was established here in 1863, but it afterwards declined until 1875, when quartz-mills were put in operation. In 1876, Butte City was incorporated, and its property is now valued at $4,000,000. Population, chiefly of foreign birth, 3363.

BUTTERFLIES, North American. During the past thirty years the Lepidopterists of America have greatly increased their stores of information respecting the butterflies of this continent. It is now maintained that there is little real identity between the European and North American insect-fauna—that while in some few instances there may be found grounds on which to base an argument in favor of identity, in the large majority of cases no such correspondences exist. Although Boreal and Alpine kinds, such as the strong-flying Vanessans and Coliades, have migrated in high latitudes, yet when all these are duly noted they will be found to be less than one dozen in number.

See Vol. IV. p. 527 Am. ed. (p. 592 Edin. ed.).

Among the districts that are rich in lepidopterous insects are California and the Pacific slope and the regions of the Rocky Mountains. According to Edwards, up to the year 1852 there were 137 known species in the United States and British North America. Within eight years 61 more were added, but since that date at least 311 others have been duly catalogued and described, so that 509 species are now recorded.

The study of their habits, and of the structure, powers, and uses of their various organs, reveals a world of marvels to naturalists. A butterfly may be said to possess something that answers the purpose of a brain; it certainly possesses an eye for colors, and has preferences in perfumes and tints, contacts and flavors.

The mere fact of butterflies being flying creatures points to the fact that their eyes are highly developed, and although they are attracted by bright colors so strongly that on first taking flight they so immediately proceed to extract sweets from flowers that the action appears to be almost automatic, yet there is reason to believe that they possess in some degree a vague sense of conscious action; although, of course, from acting so constantly under the influence of external impressions or stimulants, butterflies do not exercise the same degree of consideration as those insects that rank higher in the psychologic scale, as ants, bees, etc.

In the first stage the caterpillar lives but to eat; in the second, to sleep; in the third, to rise as it were superior to both, and to gratify more refined tastes. The love of butterflies for beautiful colors is seen not only in the selection of particular flowers, but also in the choice of mates. It is easy to see how readily the ancients were led to note in the temporary death or metamorphosis of lepidopterous insects analogies that correspond with beliefs in immortality.

Young birds see the nest in which they were reared, but caterpillars that form nests (including those that use excrement for building purposes, those that are called carpenter caterpillars, and the architectural caterpillars that construct trap-doors, etc.) have had no such opportunity for making observations, and the knowledge they employ seems to be inherited.

Even down to the formation of their societies (for some caterpillars are sociable) their conduct is well regulated. As regards what may be termed in business language our account with them, it is fair to say that we receive benefits which are not always duly estimated, and suffer losses which are perhaps unduly estimated. They supply us with silk, and eat our woollen stuffs; they aid in the fructification of plants, and yet they destroy vegetation.

"The Salt Marsh caterpillar" (*Spilosoma acrea*), which is a native of New York, Maryland, and Virginia, breeds in June and September. It changes from white to fox color. and in its last skin becomes nearly black. It is very hairy. These caterpillars eat voraciously day and night, travelling in myriads and devouring not only the produce of corn-fields, but coarse and rank weeds. The summer moth comes out of the pupa state in about seventeen days, and the autumnal moth in about thirty-three days. The *Papilio Asterias* is also found here and in Carolina. The *Papilio Philenor*, which is common in North America from New York to Georgia, is well known from its beauty as well as its frequent appearance. The larva feeds upon the *Aristolochia serpentaria*, and the butterfly delights to frequent the blossoms of peach trees. The *Actias luna*, which is found in the above States excepting Georgia, has wings that are chiefly of a beautiful pea-green color. The posterior ones are furnished with two broad tails with the extremities crimped. The *Sphinx Carolina* is found in New York, Maryland, and Virginia. The caterpillar is pale green, with white stripes and a pink tail. Being very destructive in tobacco-plantations, it is systematically destroyed by cultivators. The chrysalis is chestnut-colored. The moth breeds all through the summer, and obtains in some places the name of "mosquito hawk," from the popular error that it preys upon mosquitoes. The *Saturnia promethea* is found in New York, Pennsylvania, Maryland, and Virginia. The caterpillar on being fully developed selects a perfect leaf of sassafras or spice-wood, and attaches it firmly to the branch by winding around it many threads of fine yellowish-brown silk. The caterpillar then draws the edges of the leaves together, and encases itself in a cocoon of fine strong silk, in which it passes the winter in the pupa state hidden and protected; for although the leaf turns from green to brown and is finally swept away, the chrysalis in its cocoon is bound by its silken cords to the tree. Some of these insects, however, retire in May, and the imago appears in June.

Ajax, which is peculiar to the United States, presents attractions to the student, for in this species there is a true polymorphism and also a seasonal polymorphism in both sexes—that is to say, common parents produce offspring of different and distinct types and of both sexes, and great differences exist between their vernal and autumnal broods. Mr. Edwards gives interesting particulars on these and similar points, and states that the Ajax female hovers over the leaves of plants and trees until she finds one suitable. Then, after balancing by the rapid fluttering of her wings, she stands for an instant with legs stretched at full length, perpendicular to the body, and curving down the abdomen till it touches the surface, deposits a single egg, then flies away to return to a second leaf, and so on for consecutive days, leaving but one egg on each leaf. Here other insects attack them. A scarlet spider hardly larger than the eggs punctures and sucks them dry.

There is a strong tendency to seasonal polymorphism in the *Colias Eurytheme* in the lowlands of California that is periodically counteracted, for it has four broods per annum. The *Argynnis Diana* is fond of the purple flowers of the iron-weed. It feeds from eleven o'clock to three, being sensitive to cool air. Edwards says: "The contrast between the two sexes in this species has no parallel among North American butterflies. In the instance of *Papilio Turnus* there are females of two colors, one of which resembles the male in color and markings, and the other (*Glaucus*), while different in color, retains the markings. In *P. Turnus* there are many cases where the two colors are mingled in the same individual, giving them a brown or mottled appearance; but in *Diana* the sexes are absolutely separated in color, and on the upper surface as widely separated in markings. On part of the lower surface there is a resemblance, but any other two species of *Argynnis* that may be selected are nearer each other than are the two sexes of *Diana*."

The *Grapta Comma* is found in the Eastern and Middle States, Canada, Nova Scotia, and British America, and as far west as Illinois.

The rapid and highly ingenious manner in which the fully grown chrysalis strips off its skin and legs, without losing its hold on the wood from which it is suspended, is extremely interesting, although all suspended chrysalids perform similar operations. When completely disengaged it is soft and uncovered, so that the imago may be seen and divided, but speedily a viscous fluid is exuded that hardens and forms a strong protecting covering. In about eleven days it emerges, the wings alone being undeveloped, although complete in miniature. They soon, however, enlarge, and in thirty or forty minutes are dry and strong and ready for use.

In 1880, Baron L. von Reizenstein discovered the larva of *Smerinthus Cablei* feeding on pickerel-weed. This he regards as a link between true Sphingidæ and Bombycidæ. It was night, and the salt marshes near a summer retreat a few miles from New Orleans were illuminated for miles by electric lights when the search thus rewarded was made. This specimen does not really belong to the genus *Smerinthus*, but is clearly distinct. It is of great size and beauty. The fore wings are of pale slate-color with dark or cloudy bands; the hind wings have a white crescent in the middle surrounded by a deep black band, and the remaining surface of the wings is shaded off with brilliant crimson. The under side of the wings is comparatively less vivid, with the exception of a large crimson patch on the primaries. The outer margins of these are deeply notched, and have by degrees lighter and darker tints. The antennæ are very prominent, strongly serrated, and of extraordinary length. The discoverer proceeds to point out that in the United States there are seven different species of the genus or sub-genus *Smerinthus*, which are separated from Sphinges proper—namely, *SS. gemmatus, myops, juglandis* of the Southern States; *S. Astylus* and *modestus* of the Lake region; *S. excæcatus* of the Eastern States; and *S. ophthal* *micus* of California; and that none exceed three and a half inches in breadth, while this measures five inches, and is of another style of coloration.

The *Argynnis Leto* is found in the Yosemite district of California and in Oregon. The sexes in this species are greatly unlike, while throughout the rest of the extensive genus *Argynnis* they resemble each other very closely.

The *Argynnis Nevadensis* belongs to the valleys near Virginia City, Nev., in the warm cañons of the mountains, and by Washoe Lake. The flight is swift; they rarely alight; the males are pugnacious and chase each other. On account of the irregularity of the surface of the ground and the "sage-brush" it is difficult to take these insects on the wing.

Libythea Bachmani is found east of the Mississippi, distributed in the United States, Europe, Western Asia, Africa, Mauritius, India, and Java, and the Eastern Archipelago. It has palpi so large as to appear as an immense rostrum projecting from the front of the head, which may serve to protect the spiral tongue, yet other genera are without such protection. The males are tetrapod and the females hexapod. They are peaceable, though liberty-loving insects, for they eat leaves very unwillingly in confinement.

The *Saturnia Cecropia* is extremely handsome. The wings are richly colored—orange-brown, buff-color, red-brown, pearl-color, blood-color, white—and the serpentine lines and markings form a beautiful design. The caterpillar feeds on plum trees. It is thick and fleshy and of pale green. The cocoon furnishes silk which may be utilized.

Among the Lepidopterous insects of New York may be mentioned the *Callimorpha Phyllira*, that continues breeding all the summer, the caterpillar feeding on the crosswort, corn, peas, wheat, etc.

Other New York butterflies are *Spilosoma nais*, *Geometra transversata*, *Bupalus catenarius*, *Ceratocampa imperialis*, *Noctua undularis*, *Spilosoma Arge*, *Noctua Nundia*, *Melitæa Phaëthon*, *Melitæa Tharos*, *Catocala Epione*, *Deiopeia bella*, *Nymphalis Artemis*, *Glaucopis Pholus*, *Spilosoma Ægle*, *Sphinx Hylæus*, etc. The *Glaucopis Pholus* is also found in New England, Maryland, and Carolina.

Bibliography of Lepidoptera.—Peale, *Lepidoptera Americana*; Edwards, *Butterflies of North America*, Entomological Society, Philadelphia; Abbott, *Insects of Georgia*; Cramer, *Papillons Exotiques*; Harris, *Insects of Massachusetts*; Lucas, *Papillons Exotiques*; Packard, *Guide to the Study of Insects*; Riley, *American Entomologist*; Say, *American Entomology*; Drury-Westwood, *Exotic Entomology*, 3 vols., London; Cajetan and Felder, Vienna, *Lepidoptera*. (S. A. P.)

See Vol. IV. p. 536 Am. ed. (p. 603 Edin. ed.).

BUZZARD (Fr. *busard* or *buse*; Low Lat. *busio* or *buteo*), an inferior kind of hawk, not fitted for sporting purposes like the species of *Falco*, *Astur*, and *Accipiter*, and on that account despised by falconers, being sluggish and very timid. The name is particularly pertinent to the common buzzard of Europe, *Buteo vulgaris*, but is also applied to various other species of the large cosmopolitan genus *Buteo*. These are all large, heavy hawks, without a tooth upon the beak, of comparatively slow flight, subsisting upon the most humble quarry, and even, in some cases, upon carrion. Of the numerous described species, North America possesses nine. The best known is the red-tailed buzzard or hen-hawk, *B. borealis*, and its several varieties, generally distributed in North America; the red-shouldered, *B. lineatus*, and the broad-winged, *B. Pennsylvanicus*, are other common species of the Eastern United States. A Western species, *B. Swainsoni*, is extremely abundant; it is nearest *B. vulgaris* of Europe. The rough-legged buzzards, distinguished from all the foregoing by having the shank feathered to the toes, form a genus apart, *Archibuteo*, of which there are two North American species, *A. lagopus sancti-johannis* and *A. ferrugineus*; the latter a large, handsome, and very distinct species of Western North America, the former a variety of the European *A. lagopus*. All these birds are of economic importance from their good services in the destruction of field-mice. Popularly, the name "buzzard" is misapplied to certain of the Cathartidæ. (E. C.)

C.

CABANEL, Alexandre, a French painter, was born at Montpellier, Sept. 28, 1823. He was a pupil of Picot, and obtained in 1845 a grand prize, and went to Rome with a pension. Having returned to Paris, he exhibited between 1850 and 1853 a St. John and The Death of Moses. He gained a medal of the first class in 1855, and was chosen a member of the Institute as the successor of Horace Vernet in 1863. Among his works are Mary Magdalen; A Nymph carried off by a Faun (1859); The Birth of Venus (1863); Lucretia and Tarquin (1877); and numerous portraits. He has a high reputation as a portrait-painter.

CABLE, George W., an American author, was born in New Orleans in 1844. His business-career began in 1859, and was interrupted by his enlistment as private in the Confederate army in 1863. At the close of the war he returned to New Orleans and to mercantile life, in which he was closely employed until 1879. He began his literary career about 1869 in connection with the *Picayune*. His first stories appeared in *Scribner's Magazine* and *Appletons' Journal*, and were afterwards collected and published by Scribner in a volume entitled *Old Creole Days*, in 1877. This volume was soon followed by *The Grandissimes*, *Madame Delphine*, and *The History of New Orleans*. In 1879, Mr. Cable withdrew from commercial life with the determination to devote himself entirely to literature, to which resolution he still adheres. His novels have the merit of breaking new ground in their descriptions of life among the creole population of Louisiana, and the recognition awarded him as a fiction-writer of high ability has been very general, and in many cases enthusiastic.

CADILLAC, the county-seat of Wexford co., Mich., is on Clam Lake and on the Grand Rapids and Indiana Railroad, 98 miles N. of Grand Rapids. It has a bank, six hotels, an opera-house, a weekly newspaper, six churches, good schools, and water-works. It carries on a large trade in lumber, has thirteen saw-mills, three planing-mills, and manufactures of machinery and furniture. It was settled in 1871, incorporated as the village of Clam Lake in 1874, and as the city of Cadillac in 1877. Population, 2213.

CAIRD, John, D. D., a pulpit-orator of the Scottish Established Church, was born at Greenock in 1823. He was educated at the University of Glasgow, where he gained several prizes. In 1845 he was ordained as minister of Newton-on-Ayr, from which he removed in the same year to Lady Yester's church in Edinburgh, and in 1850 became pastor at Errol in Perthshire. Here he remained until 1858, when he removed to Glasgow as minister of the Park Church. His fervid eloquence gave him a wide reputation, which was increased by a sermon which he preached before Queen Victoria and Prince Albert at the parish church of Crathie in 1855. This sermon, called *Religion in Every-day Life*, was subsequently published at the desire of the queen. In 1860 he received the degree of D. D. from the University of Glasgow, and in 1862 was called to the chair of divinity in that institution. In 1873 he was made principal and vice-chancellor of the university. He has published a volume of sermons and many lectures, including one on *The Universal Religion*, delivered in Westminster Abbey November, 1874. In 1880 he published *An Introduction to the Philosophy of Religion*.

CAIRNS, Hugh MacCalmont, Earl, lord high chancellor of Great Britain, was born in December, 1819, the second son of William Cairns of Cultra, county Down, Ireland. He was educated at Trinity College, Dublin, where he took first honors in classics. He was called to the English bar at the Middle Temple in 1844, and soon gained an extensive practice in the courts of equity. In July, 1852, he was elected to Parliament from Belfast, and his ready eloquence soon made him one of the most prominent members on the Conservative side. In 1856 he was appointed queen's counsel and a bencher of Lincoln's Inn. When Lord Derby became prime minister in February, 1858, Mr. Cairns was made solicitor-general, and soon after received the honor of knighthood. He especially distinguished himself in debate, for which his training at the bar had fitted him. He held the position of solicitor-general until June, 1859, when Lord Derby resigned, and when, in 1866, that statesman was again called to form a cabinet, Sir Hugh Cairns was made attorney-general. In October of that year he was appointed a lord justice of appeal, and in February of the following year he was raised to the peerage as Baron Cairns of Garmoyle, county Antrim. In the House of Lords he gave earnest and effective support to Mr. Disraeli's Reform Bill. In February, 1868, he was made lord high chancellor, thus attaining the highest legal position in Great Britain. He held this office till the resignation of Mr. Disraeli's ministry in December, 1868, having in the mean time made several great speeches, but especially one on the Irish Church Suspensory Bill. In consequence of the success of the last he was in the following session of Parliament appointed leader of the opposition in the House of Lords. In February, 1874, when the Conservative party again came into power, Lord Cairns was again appointed lord high chancellor. In September, 1878, he was created Viscount Garmoyle and Earl Cairns. In 1880 the Liberal party triumphed in the elections, and Earl Cairns again retired from office. In 1867 he was elected chancellor of the University of Dublin. His success throughout his career has been due entirely to his great abilities, indomitable energy, and unwearied labors. His eloquence, though effective and brilliant, is lacking in poetic qualities; his speeches are argumentative and logical rather than profound or emotional. His religious character is not less marked than his ability as a lawyer and statesman.

CALAIS, a city of Washington co., Me., is at the head of navigation on St. Croix River, 12 miles above Passamaquoddy Bay, and opposite St. Stephen, N. B., with which it is connected by four bridges. It is 85 miles E. N. E. of Bangor and 70 miles W. of St. John, N. B., with both of which it is connected by steamboat and railway. There is also a short railroad to Princeton, Me. Calais has two hotels, a national bank, a savings bank, an opera-house, two public halls, two weekly newspapers, ten churches, and sixteen school-houses with thirty schools. It has a brass-foundry, two iron-foundries, three machine-shops, seven saw-mills, four planing-mills, a furniture-factory, three grist-mills, a plaster-mill, and granite-works. It was settled in 1779, incorporated in 1809, and chartered as a city in 1850. It is lighted with gas, and is picturesque in appearance. Its property is valued at $2,000,000; its public debt is $100,000, and its yearly expenses are $35,000. Population, 6173.

CALDERON, Philip Hermogenes, an English artist of Spanish descent, was born at Poitiers, France, in May, 1833. He was taken to England in 1846, and his first art-studies were made in London. In 1851 he went to Paris, where he received instruction from Picot. Calderon first exhibited at the Royal Academy in 1857, his picture of that year being entitled Broken Vows. Thereafter he was a regular contributor to the Academy's and other exhibitions of historical and genre compositions and portraits. Among his best and most celebrated works are The Jailer's Daughter (1858), Nevermore, Her Most High, Noble, and Puissant Grace, The Young Lord Hamlet and Yorick (1868), On her Way to the Throne (1871), Day of the Massacre of St. Bartholemew, The Moonlight Serenade, The Queen of the Tournament (1874), Toujours Fidèle (1875), Watchful Eyes (1876), His Reverence (1876), Joan of Arc (1877), Constance, Victory, and La Gloire de Dijon. He received gold medals at Paris in 1867 and 1878, and he was represented at the Centennial Exhibition of 1876 at Philadelphia by three pictures—After the Battle, Desdemona, and The Siesta. At the Vienna Exhibition in 1873 he gained another medal, and in 1878 he was admitted to the Legion of Honor. In addition to his composition pictures this artist has painted a number of portraits. He was made an associate of the Royal Academy in 1864 and a full Academician in 1867. Calderon, thanks to his continental training, is a better draughtsman and a better technician generally than most of his contemporaries among English artists. His historical pictures are well-arranged compositions which tell their stories with a sufficient clearness if not with remarkable force. His best works, however, are representations of sentimental or familiar subjects. He is master of a graceful style, and subjects which are distinctly within the range of his powers he treats charmingly. (W. J. C., JR.)

Seal of California.

CALIFORNIA, a State of the United States, occupying the greater part of that country's coast on the Pacific Ocean, and having climate and productions differing widely from those of most of the other States, is described below, especially with relation to the changes and growths of the past five years. The population, by the census of 1880, was 864,694, which, compared with that of 1870, made the following showing:

See Vol. IV. p. 615 Am. ed. (p. 694 Edin. ed.).

	Total.	Males.	Females.	Native.	Foreign.
1870	560,247	349,479	210,768	350,416	209,831
1880	864,694	518,176	346,518	571,820	292,874

The first United States census taken in California was that of 1850, but its figures are untrustworthy, the returns having been in part destroyed by fire. It showed a population of 92,597; the census of 1860 showed a population of 379,994. Of the total returns in 1880, 767,181 were whites, 6018 colored, 75,132 Chinese, 86 Japanese, and 16,277 Indians. (In 1870 the Chinese were returned as numbering 48,826 born in China, and 484 born in the United States.)

Gold-mining.—Although the product of the gold-mines has been steadily diminishing for nearly thirty years, this branch of business may justly take precedence in any detailed description of California industries. The following table, showing the annual bullion production from the inception of gold-digging to date, affords a comprehensive view of the rise, progress, and partial declension of the business. It is not claimed to be absolutely accurate, but is derived from the best sources attainable:

Year.	Product.	Year.	Product.
1848	$5,000,000	1866	$26,000,000
1849	23,000,000	1867	25,000,000
1850	51,000,000	1868	22,000,000
1851	55,000,000	1869	22,000,000
1852	59,000,000	1870	23,000,000
1853	65,000,000	1871	20,000,000
1854	62,000,000	1872	19,000,000
1855	58,000,000	1873	18,000,000
1856	57,000,000	1874	20,000,000
1857	55,000,000	1875	18,000,000
1858	53,000,000	1876	19,000,000
1859	50,000,000	1877	18,200,000
1860	46,000,000	1878	19,000,000
1861	42,000,000	1879	18,200,000
1862	40,000,000	1880	18,000,000
1863	35,000,000	1881	18,000,000
1864	30,000,000	1882 (estimated)	17,600,000
1865	28,000,000	Total	$1,155,000,000

Although the bullion of California is generally regarded as gold, about 5 per cent. of that turned out of late years has consisted of silver, a few mines in the State being worked solely or principally for that metal. Most of the bullion made from the gold-bearing quartz also carries some silver.

In the output of 1882 the gold-crop of California has reached its minimum, at least for the present, the prospect being that there will now ensue a gradual increase of production, which, once begun, may be expected to go on for a number of years, perhaps until it reaches a quarter or even a third more than it now is. This expectation is based chiefly on the increased attention being paid to vein-mining and the improvements that have been made in every branch of the business, and partly on the likelihood of an early adjustment of the difficulties that for several years have existed between the landowners and the hydraulic miners. Some gains, too, it may be hoped, will arise out of the more stable habits of the mining population, the tendency to lower prices all round, wages of labor included, and the further improvements that may be anticipated in machinery, processes, etc.

Gold-mining as now conducted in California is divided into three principal branches—vein, hydraulic, and drift—each distinguished by the character of the deposits mined and the machinery, implements, and methods employed in it. Vein- or quartz-mining, as it is more generally termed, consists in exploiting the ore-bearing lodes or veins by means of shafts, inclines, or tunnels, and removing their contents, which are then finely pulverized under heavy iron stamps, whereby most of the gold is released from its containing matrix, though left mixed up with the same. The resulting mass, called "pulp," is then subjected to a variety of manipulations and processes for extracting the gold it contains, the agency most employed for this purpose being amalgamation with quicksilver.

Of the total gold-product of California, the proportion taken out by each of these several branches of mining is given in a paper recently prepared by Dr. Henry Degroot for the California State mineralogist, and published by authority of the legislature, as follows: Vein-mining, 35 per cent., hydraulic, 30 per cent., and drift, 25 per cent., the remaining 10 per cent. being credited to the various other modes of placer-mining practised in the State. Included in the product of the hydraulic mines is the small amount of gold extracted from the indurated gravel taken from the hydraulic pits and crushed under stamps, this stuff being too hard to be disintegrated with water.

Vein-Mining.—There are in California about 400 quartz-mills, exclusive of nearly an equal number already worn out or which for other reasons have been abandoned. These mills, about one-fourth of which are run by water and the remainder by steam, carry from five to eighty stamps each, the average being about ten. Their cost has varied with size, outfit, etc., expenditure for construction having been at the rate of $1000 per stamp for small, and rather more for large mills, some of the latter, where very complete in their appointments, being equipped with rock-breakers, automatic ore-feeders, amalgamating-pans, concentrators, chlorination-works, etc., having cost as much as $3000 per stamp. The building of this class of mills began in California as early as 1850, the most of those put up for some years having at first, however, been of limited capacity and simple construction. As with every branch of mining for the precious metals, this has been beset with many difficulties, the most formidable at first having been the high prices of labor and supplies and an imperfect knowledge of the business on the part of those who had engaged in it. As a consequence, many of these enterprises failed of success, the mineral districts of California abounding with abandoned mines and dilapidated quartz-mills.

Besides these mills, something like 100 arastras are being run in the State. This machine is capable of working about one ton of ore per day, a little less than the average quantity crushed by each stamp run. The arastra is used for prospecting and where there are only small quantities of rich ore to be worked, the most of these machines being owned and operated by Mexicans, who have been accustomed to use them in their own country.

The expenses attendant on mining and milling the gold-bearing ores of California range from three to fifteen dollars per ton of 2000 pounds, the average being about six dollars. Only where the conditions are unusually favorable does the cost fall as low as three dollars per ton, while it seldom amounts to less than fifteen, where the ores require to be beneficiated by the more expensive methods, or carry so large a percentage of sulphurets as to render expensive concentration and chlorination necessary, this method of treating the pyritiferous ores having maintained its popularity against the many new plans that from time to time have claimed recognition.

In so far as the crushing service is concerned, California, if not in advance of all other vein-mining countries, is certainly behind none, nor will pan-amalgamation, much practised here, suffer by comparison with the methods elsewhere adopted.

Hydraulic and Drift Mining.—Hydraulic mining consists in the plan of breaking down and disintegrating the banks of auriferous gravel as they stand in place by means of water discharged against the same in large quantity and under great pressure, this gravel being afterwards carried by the released water into sluices furnished with riffles and other appliances for catching and retaining the gold. In drift-mining that portion of the auriferous gravel that is to be handled is reached and removed through shafts or tunnels, only a thin stratum of the richest material lying next the bottom being taken out. The gravel removed on being brought to the surface is washed in sluices, as in hydraulic operations.

Owing to the large quantities of detritus or tailings discharged from the hydraulic mines into the creeks and rivers, much damage has been done to the low-lying lands along and adjacent to these streams. Having vainly protested against the continuance of this practice, the owners of the lands so injured or exposed to injury, associating themselves together, procured injunctions to be issued against many of the hydraulic miners, restraining them from further emptying their débris into these outletting streams. After several years of fruitless litigation the hydraulic miners have, by a judicial decree recently rendered, been required to so impound or otherwise take care of the coarser and more hurtful portions of these slums that they shall no longer make their way into the rivres. Recognizing the justice of this decision, the miners have everywhere commenced the construction of capacious dams below their claims for the retention of this stuff, which end they will probably so far accomplish as to prevent further litigation between the parties to this contest. As both the State and the general Government are interested in preserving the free navigation of such waters as have been partially obstructed by this mining débris, it may reasonably be expected that they will do something towards removing existing impediments to the same, if they do not also aid the miners in their efforts to prevent future injury to the farming lands and the further shoaling of the rivers. These retaining dams will be capacious and expensive structures, some of them having capacity to hold many million cubic yards of tailings and costing as much as $200,000 each. Should the cost of their construction be thrown wholly on the miners, it would impose upon them a heavy burden, as dams of this kind will be required at many different localities.

The legislature of California in 1881 appropriated the sum of $500,000 for building impounding dams on Bear River and the Yuba, the streams most obstructed with tailings, and along which the greatest damage has been done to the farming lands; the quantity of which rendered for the present nearly worthless amounting here to as much as 25,000 or 30,000 acres, of the average value of $40 per acre; the damage to the farming lands in like manner caused elsewhere amounting to at least half as much more. With the money so appropriated a dam was commenced at an eligible point on the main Yuba, and carried nearly to completion, when this act of the legislature was declared unconstitutional by the supreme court of the State, causing work on it to be suspended. Left in an incomplete state, a portion of this structure was afterwards swept away by the high water, and, having never been repaired, its efficiency as a débris-impounder remains (1882) untested.

In the prosecution of hydraulic mining great quantities of water are required, some of the larger companies using as much as 4000 miner's inches for eight or ten months in the year. While the miner's inch of water is a somewhat uncertain quantity, varying slightly in the different districts, it is generally understood to mean the quantity that will escape through a hole 1 inch square in a 2-inch plank, with the water standing 6 inches above the centre of the orifice, and which amounts to 21,000 gallons in twenty-four hours. Measured by this standard, the water-consumption of such companies amounts to 84,000,000 gallons daily, or something like 20,000,000,000 gallons each working season.

For conveying this water from the supplying lakes and rivers to the mines many ditches have been constructed, some of them large, long, and very costly. Of these artificial water-courses there are at present in the mining regions of California about 500, having an aggregate length of nearly 5000 miles. In length these ditches vary from two or three to seventy-five miles, in carrying capacity from 200 to 4000 inches, and in cost from $500 to $3000 per mile. On an average their length may be set down at eight to ten miles, capacity 1000 inches, cost $2000 per mile, reservoirs, dams, flumes, iron conduits, etc., included, some of these appendages having been attended with heavy expenditure. The carrying capacity of a few short ditches in the State exceeds the largest figure above given. The main trunk of the South Yuba Canal Company conveys throughout its entire length 7000 inches of water, this company delivering to the mines supplied by its system of ditches 200,000,000 gallons daily—more than three times as much water as the city of New York receives through the Croton aqueduct.

From the foregoing enumeration has been omitted many small ditches tributary to the larger ones, also such as, having served their original purpose of supplying water to diggings since exhausted, have fallen into disuse, with some few that for other reasons have been abandoned; the aggregate cost of these works having amounted to many million dollars.

In the building of these ditches some bold feats of engineering have been displayed, especially in the construction of the trestles for supporting the flumes along them, and in the laying down of iron pipes for the transmission of water across deep gorges, river-valleys, and other depressions, some of these trestles being over 200 feet in height. Instead of trestles for supporting the flumes, these structures have sometimes been suspended midway along the sides of precipitous cliffs over 300 feet high. The Spring Valley Company convey its ditch-water across the west branch of Feather River through an iron pipe in the form of an inverted syphon, which at its point of greatest depression is 900 feet below the ditch-level. Some of the reservoirs built by these hydraulic companies for water-storage are of large size and have cost from $100,000 to $250,000 each.

While hydraulic mining is carried on in the gravel-banks that stand over or outlie the "Dead Rivers" of the Pliocene age, drift operations are confined to the deep-lying channels of these ancient streams, so inhumed and obliterated by volcanic flows, mountain uplifts, drift and glacier movements, assisted, possibly, by tidal action, ocean surfs, and other active agents of destruction. In the prosecution of this latter branch of mining recourse is had to shafts and tunnels for opening up and removing the auriferous deposits, which always lie on the bottoms of the buried rivers, and generally from 50 to 200 feet below the surface. Some of these tunnels are of great length, as are also many of those driven to bottom, the hydraulic banks that run for furnishing outlets to the grounds of the North Bloomfield Company being 8000 feet long and costing nearly $500,000. The tunnel of the Bald Mountain Drift Company, at Forest City, is a mile long, including length of deposits removed. The drift-tunnels vary in length from 1000 to 2000 feet, and in cost from $10 to $20 per linear foot, their usual dimensions measured transversely being about 4 feet by 7, though many are much larger.

Other Methods of Placer-Mining.—While hydraulic and drift constitute the leading departments of placer-mining, there are still a number of subordinate branches of the business, each characterized by the mechanisms and modes employed in its prosecution or the kind of diggings in which it is carried on. Thus, we have *river-bed mining*, conducted by two methods—wing-damming, whereby the water is excluded from a portion of the river-bed by an embankment carried out from one shore; and fluming, by which plan the whole of the water is diverted from the channel and carried in ditches or flumes along the bank, leaving the river-bed opposite entirely bare. After being so laid bare by either of these methods, the gold-bearing gravel found in the bottom of the river is removed and washed in sluices. Though generally profitable, this style of mining is precarious: the river-bed is apt to be spotted, paying largely in some places and very little in others; the season for operations is short, and sometimes abridged by premature freshets, which sweep away the miner's works just when he is about to commence or when he may be in the midst of his harvest. Almost always these works, consisting of dams, wheels, sluices, derricks, etc., are carried away by the winter floods, necessitating their replacement the next year; therefore the fortunes of the river-bed miner are, like his diggings, very uneven. The most of the larger operations of this kind have of late years been confined to the Klamath and other northern rivers, the beds of the streams farther south having in former years been so depleted by this method that they have mostly been given up to the Chinese, who, adopting the cheaper plan of wing-damming, manage to make some portions of them pay.

Dry diggings are of two kinds—one, where there is no water for washing or only a scanty supply in the winter; and the other, where the gold is separated from the auriferous earth by winnowing on rawhides or by machines made for the purpose, no water at all being used in these processes. Dry washing, so called, is not much practised in California, though common in Mexico and some other countries where the laborer is content with small, easily-earned wages. *Seam diggings* consist of small but rich veins of gold-bearing quartz so much decomposed that they can be piped out, aided by the pick, and worked somewhat after the manner of hydraulic ground. This class of deposits is not extensive, and occurs in only a few localities.

Silver-Mining.—The silver-mines proper—or rather, it should be said, the argentiferous ore-producing districts—of California lie for the most part east of the Sierra Nevada, in the counties of Alpine, Inyo, and Mono, where they cover a wide scope of territory. Although the business of mining for this metal has been actively prosecuted in the above localities for a good many years, having been liberally backed with capital and having absorbed much labor, it can in no sense be considered a success, this entire trans-Sierra region abounding with deserted towns, abandoned mines, and dismantled reduction-works. The Cerro Gordo mines, Inyo county, yielding lead-silver ores of the smelting variety, were at one time worked with profit, but of late years they have produced but little; nor are any mines in these counties making a large bullion-production at present, though a number are being worked in a small way, there being also several gold-mines in the Bodie district, Mono co., operated with success. The discovery of promising deposits of silver-bearing ore is reported in both Shasta and San Bernardino counties, but at neither point have sufficient developments been made to establish for these deposits a large and unmistakable value.

Quicksilver, Copper, Lead, and Iron.—These are among the metals somewhat extensively mined in California. The making of *quicksilver* commenced at New Almaden as early as 1846, and has, with but little interruption, been continued ever since, the average annual output of these mines having been a little over 20,000 flasks; total product, about 750,000 flasks. During the past twenty years deposits of cinnabar have been found at many other points in the State, the most of them being in Napa, Sonoma, Lake, San Luis Obispo, Fresno, and Trinity counties. About eight years ago this branch of mining, by reason of the numerous finds made at that time and the then prevailing high prices of this metal, received a great impetus, many additional furnaces having been erected and ore-deposits opened up; which led to such an over-production that prices, ruling at $1.37 per pound in 1874, dropped to 50 cents in 1877, since which time they have averaged about 38 cents in San Francisco, the sole receiving and distributing point on the coast. Present indications denote a steady market at about that figure, unless a combination should be effected for restricting the output—a policy that producers have been endeavoring to carry out for several years past, and which, if inaugurated, might be expected to advance prices somewhat, at least for the time being.

While the mass of the cinnabar worked in California does not yield over 1½ per cent. of metal, that from the New Almaden mines, in Santa Clara county, and the Altoona mine, in Trinity county, yields from 60 to 80 per cent. more. The only mines now making any considerable production in the State are the New Almaden, Napa Consolidated, Great Western, Sulphur Banks, and Reddington, each of which produces from 5000 to 15,000 flasks per annum, there being eight or ten small mines besides which turn out yearly a few hundred flasks each. Six years ago there were as many as seventy furnaces, large and small, employed in the production of quicksilver; now there is not one-half that number; those running at present are, however, mostly of large capacity, roasting from twenty to forty tons of ore each per day. The annual California product of this metal for the past five years has been as follows: 1877, 79,336 flasks; 1878, 63,880 flasks; 1879, 73,684 flasks; 1880, 59,926 flasks; 1881, 58,635 flasks; the product for 1882 being estimated at about 5000 flasks less than that of 1881. Of the quicksilver made, about 65 per cent. is exported to foreign countries, the balance being consumed in the State and the mining-regions adjacent. The largest consumers of California quicksilver are China and Mexico, the former taking an average of 17,000 flasks, and the latter 14,000, annually. This metal is also sent in small quantities to Central and South America, New York, Japan, and Australia. For several years the Comstock mines supplied a market for about 1600 flasks of quicksilver monthly. For the past three years the requirement for these mines has been small—a loss that has, however, been more than made up by increased demands in other quarters, the growth of mining in Arizona and other outlying Territories having been attended with a corresponding consumption of this metal.

While *cupriferous ores* of fair quality and in considerable abundance are found at many points in California, the attempts made at utilizing these products have proved generally disappointing, whether directed to effecting reduction on the ground or shipment abroad. Though a good stock of ore and a tolerable market have rendered the business for a time self-sustaining, yet by the speedy exhaustion of available deposits and the fall of prices it has suffered early eclipse, tho prosperous career of these enterprises having rarely ever extended beyond two or three years, the most of them being much shorter lived. Leading such a precarious existence, copper-mining has dwindled to small proportions compared with what it was twenty years ago, when the Copperopolis mines, being in "bonanza," were shipping heavily to a remunerative market. Since the decadence of these mines, some fifteen years since, California exports have been much reduced. While the practice has been to send away the better-grade ores, the most of them going to England and Baltimore, those of poorer quality have been reduced to *matte* either at the mines or at works located elsewhere, the largest at Melrose, Alameda co., both smelting and lixiviation being employed in their treatment. Latterly, the most extensive operations in this line have been carried on by the San Francisco Company at Spenceville, Placer co., where it has opened up a large body of medium-grade ore. In reducing this ore it is placed in heaps of a thousand tons or more on layers of wood, which, being fired, ignites the mass, the sulphur in the ore supporting combustion until the entire heap is desulphurized, the process requiring from four to six months. After roasting, the ore is subjected to leaching, the copper being precipitated from the solution by the use of scrap iron. These precipitations, which are then ready for market, assay from 85 to 90 per cent. fine. Some 10,000 tons of ore are reduced at the Spenceville mine annually, producing about 350 tons of precipitates, the most of which find a market at the various refineries. The present annual shipments of copper ores from San Francisco amount to about 2000 tons, the output of the Arizona and Nevada mines, most of that which formerly came to this port for shipment being now sent to Eastern markets by rail.

Lead-mining, as a distinct industry, is not carried on in California, the considerable quantities of this metal heretofore consumed in or shipped from the State being the product of the argentiferous galena brought from Arizona or of the lead-silver bullion made at the Cerro Gordo mines, Inyo co., and the Eureka mines in the State of Nevada, the most of this ore having been smelted and this bullion parted at the Selby Smelting and Refining Works in San Francisco, the lead being run into pigs and the silver sent to the mint. San Francisco receipts of base bullion for 1881 amounted to 4,344,000 pounds—lead, 12,114,000 pounds; total receipts of the former for past five years, 60,000,000 pounds; of the latter, 28,973,000. The lead goes mostly to New York, prices following those of that market. Shipments to that port for 1880 amounted to 9190 tons, value $1,111,953; for 1881, to 7652 tons, value $1,467,442. The home consumption of lead, some 2000 tons, is mostly in the form of shot, balls, sheet lead, and pipe, of which about enough is made to meet local requirements.

Ferruginous ores of various kinds and good quality abound in California, some eligibly situated as regards accessibility, timber, and water, and others quite the reverse. Not, however, until recently has any attempt been made at manufacturing iron in this State, and this notwithstanding the prices of that metal have always been high, the consumption considerable, and prospective requirements great. The chief obstacle in the way of iron-making here has been lack of a suitable mineral coal for the purpose, none being found in the country. There is in the vicinity of most of these deposits an abundance of timber from which charcoal could be burned, but the making of this has generally been considered too expensive. In the early part of 1881 the California Iron Company, having erected smelting-works at Clipper Gap, Placer co., started its furnaces in April of that year, turning out during the next seven months 4250 tons of iron, which was sold in San Francisco at the rate of $28 per ton, being $2 less than ruling rates for the imported article. The product of these works for 1882 is estimated at 10,000 tons, of a quality that will enable it to compete successfully with the best foreign varieties. Imports of iron at San Francisco, mostly Scotch, have for some years past ranged from 10,000 to 17,000 tons.

Chromic iron has for several years past had a place on the list of California exports, there being immense deposits of this ore in different parts of the State. Many of these cannot, however, be made sources of present revenue, long wagon-transportation shutting them out from market. From those more eligibly situated in this respect, enjoying the advantages of railroad or water carriage, from 8000 to 10,000 tons of chromium have been extracted annually and shipped abroad, the larger portion going to Baltimore, and the balance to Scotland. This ore is of good grade, carrying from 50 to 60 per cent. of chromic acid. The prices received in San Francisco were $17 per ton for 50-per cent. ore, a figure that left the shipper but small margin for profit. With a slight advance in price chrome could be shipped from California in great quantities.

Coal, Salt, Sulphur, Borax, and Petroleum.—The only coal-beds yet opened up to any great extent in California are situated on the northerly slope of Mount Diablo, forty miles east from San Francisco, 900 feet above and five miles distant from tide-water. The workable veins, two in number, varying from three to five feet in thickness, supply a fair article of bituminous, non-coking coal. It is a good fuel for domestic uses and the generation of steam, but does not answer for making gas or for smelting purposes. These mines have been actively worked for the past twenty years, furnishing large quantities of fuel for the San Francisco market, the delivery at that point in 1881 amounting to 103,055 tons, about 75 per cent. of the average for the preceding ten years. Small quantities of coal of similar quality are gotten out at two or three other places in California, the value of the entire product of the State amounting to about $1,000,000 per annum. The imports of coal at San Francisco during the year 1881 were as follows: from Seattle, Washington Territory, 147,418 tons; Coos Bay, Oregon, 21,246 tons; British Columbia, 158,629 tons; Australia, 126,296 tons; Great Britain, 281,313 tons; anthracite, 13,697 tons; Cumberland, 24,982 tons, with a few small lots from Sitka and other places—total receipts for the year amounting to 899,680 tons, being 15 per cent. greater than in any previous year. The receipts and consumption for 1882 promise to be as large as in 1881. Wholesale prices of coal in San Francisco varied during the year 1881 as follows: Australian, $6.25 to $11 per ton; California, $4.50 to $5.50; anthracite, $12 to $18; Seattle, $7 to $10.

Common salt is one of those commodities for which Nature has made ample provision and placed within easy reach, but which Californians still continue to import largely from other countries. Besides the many natural salines found within or just over the boundaries of the State, California, through her long dry seasons, possesses great advantages for producing this article cheaply by means of solar evaporation, which to some extent is employed for that purpose. Between domestic uses, meat-packing, ore-reduction, the curing of fish, hides, etc., California consumes much salt—between 35,000 and 45,000 tons annually. To meet these requirements she imports large quantities from Liverpool; also some from Carmen Island, Lower California. The balance is made at home, the principal part of it at the works located on the easterly shore of San Francisco Bay, being produced from sea-water evaporated by solar heat. At that point exist many large lagoons, some of which have at little expense been converted into extensive reservoirs. These being filled in the winter, the water, exposed to the warm and desiccating atmosphere, has all escaped by the month of June, leaving a heavy stratum of impure salt behind. This is a cheap article, selling for $5 or $6 per ton, being used for hide-salting and other coarse curing. When a better article is to be made, the brine, when at 25°, is run off into wooden vats, and the process of evaporation there completed, the result being a salt almost chemically pure. This product, being shovelled into heaps and left long exposed to the air, becomes further purified and whitened, when it is ready for grinding. Salt is made by a similar process at Santa Monica, San Diego, and other points on the southern coast, the quantity turned ont from the artificial salines amounting to 25,000 tons per year. The price of salt in San Francisco varies from $5 to $6 per ton for the lower grades, and from $15 to $20 per ton for the better qualities. There are six mills in San Francisco engaged in grinding salt for culinary purposes.

Sulphur is plentiful, there being heavy deposits of this mineral in Lake and Colusa counties, where it has been utilized to some extent, works having been put up there fifteen years ago, and several hundred tons of refined sulphur turned out annually by simple distillation. Latterly, these works have produced but little, being unable to compete with importations, the foreign article, brought mostly from Sicily, being sold at about $45 per ton in San Francisco—a figure that scarcely allows the local producer any profit. Five years ago the Humboldt mines in Nevada came in as a further competing source of supply. Most of the deposits of this mineral on the Pacific coast are rich, containing from 40 to 60 per cent. of sulphur. At the beds in Lake county solfataric action is still going on, depositing sulphur from the vapors and steam issuing from the extensively-fissured volcanic rocks.

While *borax*, the biborate of soda, is found at several places in California, only in the locality known as the Slate Range Marsh, San Bernardino co., does it occur in such quantity and under such conditions as to render it of much commercial value. The Riddell Company, operating at this place, has erected there reduction-works with a monthly capacity of 1200 tons. The annual receipts of manufactured borax at San Francisco averaged for 1880 and 1881 a little over 2000 tons, of which about one-half came from salines in the State of Nevada. Nearly the entire product of the coast is exported, two-thirds going to New York, and the remainder to England.

Although *petroleum* is a widely-diffused product in California, occurring in most of the coast counties, workable deposits have been found only at a few points, mostly in Los Angeles and Ventura counties. Notwithstanding much tunnelling and boring have been done, no flowing wells, like those of Pennsylvania, have been developed, the oil obtained from the wells bored being, with few exceptions, raised by pumping. The deepest borings reached have been about 1600 feet; the largest flow obtained, 75 barrels per day—from five to fifteen barrels per day being about the average quantity. Refineries have been erected near the wells, where a good illuminating and a superior lubricating oil is made. Pipe-lines have been constructed to aid in transportation.

Among minor metalliferous and mineral resources of the State are the following, some of which have already been made the objects of mining enterprise, and must ultimately become sources of considerable wealth to the country: Antimony, in heavy deposits at San Emedio, Kern co., and the Stayton mine, San Benito co.—ore carrying from 30 to 50 per cent. of metal. Extensive works were put up at the former place in 1876, but failed of success by reason of too expensive transportation to market, cost of getting in supplies, etc., the mine being situated in a mountainous district and a long way from the railroad. Asphaltum, in immense beds on the ocean-beach near Mount Hoar, Ventura co., whence several thousand tons are annually shipped at little cost to San Francisco, where it is used for roofing, laying down sidewalks, paving streets, etc. Smaller deposits exist elsewhere in the State. Gypsum, over a large area near the line of the Southern Pacific Railroad, Los Angeles co.; value of the deposit not yet proven. This mineral occurs elsewhere in the State, also abundantly in Arizona near the above railroad and not far from the California line. Possessing the property of neutralizing the alkalies, this mineral must eventually come into large requisition in California, where there is so much land impregnated with this salt. Asbestos and isinglass, tolerably abundant and of kinds likely to make them useful in the arts. Kaolin and other clays suitable for making fine pottery, fire-brick, etc. Stanniferous ore *in situ;* also stream tin reported; but not enough of any kind to make these fields important except as encouragements to more careful search after larger deposits of this valuable metal. Mountains of marble of cloudless white or wonderfully variegated hues, the beds so deep and the rock so firm that immense blocks can be readily broken out. Mineral paints and other pigments, representing nearly all the fundamental colors and of well-established utility. Roofing slates and good building-stone of all kinds. Graphite, manganese, cobalt, platinum, iridium, and tellurium. Hydraulic cement, of which large quantities are made, nearly shutting out the foreign article, once largely imported. Carbonate of soda. Glauberite, found at Borax Lake, the only place where this salt has as yet been recognized on the continent. Diamonds of pure water, but small size, have been found in the auriferous drift of California; also opals at various points, but not of the precious kind. Garnets and like common stones are frequently met with. Thus, it will be seen, California in the domain of minerals has rich endowments, hardly another country in the world possessing this form of wealth in such great variety, large store, and wide distribution.

Agricultural Products and Pursuits.—Rich as California is in minerals and metals, her agricultural resources cover an equally wide range, being at the same time even more diversified, her soil and climate producing much that is common to both the temperate and the semi-tropical zones. In few other countries is such a varied husbandry practicable as here. Covering nearly ten degrees of latitude, California grows and matures the orange, lime, lemon, and banana, together with the hardier fruits and the cereals that thrive equally well in the distant north. Large areas of the great interior valleys are admirably suited for growing both wheat and cotton, while the Colorado bottoms are equally well adapted for the culture of ramié, jute, and sugar-cane. For raising rice there are probably nowhere any better lands than the vast tulé-marshes lying along and at the junction of the Sacramento and the San Joaquin, while for viniculture the soil over a third of the State may be said to be eminently fitted.

The subjoined data, showing production made of certain agricultural staples in the year 1881, may be prefaced with the remark that in this department of industry the tendency in California has ever been in the direction of big operations. The rule is, large farms and large dairies. So, too, the vineyards and orchards are apt to be extensive. The Glenn farm in Colusa county comprises 60,000 acres of land, two-thirds of it constantly under the plough, over 1,000,000 bushels of wheat being sometimes harvested there in a single season. This is all rich agricultural land enclosed and under tillage, there being other and much larger tracts, the property of single individuals, firms, or companies, but the most of these are wholly or chiefly devoted to dairying or to cattle- and sheep-raising. The firm of Lux & Miller owns 228,000 acres of grazing lands. The Beale "Ranch"—the latter a name often given to these large tracts of grazing lands—contains 173,000 acres; the McLaughlin Ranch, 141,000 acres. There is a large number of these estates in California that contain between 40,000 and 80,000 acres of land, there being 453 that exceed 5000 acres, and 148 that contain between 10,000 and 20,000. In some cases the most of this land is mountainous and fit only for pasturage; a large proportion of it, however, is well adapted for grain-raising. According to the U. S. census of 1880, California contains 20,214 farms that comprise from 100 to 500 acres each; 8967, from 50 to 100 acres each; 3475, from 20 to 50 acres each; and 2531 that contain over 1000 acres each. The big vineyards in the State, like the big farms, are numerous. On the Glenn farm over 300 acres have recently been planted to vines, the most of them of the varieties best adapted for making raisins. The vineyard of Stern & Rose, near Los Angeles, covers 735 acres, and contains over 500,000 vines, the most of them in full bearing, planting having been commenced here in 1860. The orange-grove of this firm counts 12,000 trees. The vineyard of the Buena Vista Company, near the old town of Sonoma, contains nearly 500,000 vines, there being many others in the State that contain from 50,000 to 300,000 vines each, the settings usually being at the rate of about 700 vines to the acre. While the dairies of California are seldom of such overgrown proportions as the farms and vineyards, they are still apt to be large compared with the average elsewhere, numbering usually from 25 to 150 cows. On the lands of Shafter & Howard, in Marin county, over 3000 cows are grazed, the entire number being, however, divided up into some thirty-five or forty dairies. Allen & Son, of Green Valley, milk 350 cows; several other dairymen in the State milking half that number. Many cattle-raisers own from 50,000 to 100,000 head of stock, the flocks of the principal wool-growers being nearly as large.

While the California wheat-crop of 1881 amounted to 28,250,000 centals, that of 1882 was estimated at 28,000,000 centals—over 46,500,000 bushels. The average yield of wheat in this State is a little over twenty bushels to the acre, 30 to 50 per cent. less than it formerly was, much of the soil, through long-continued cropping, having become somewhat impoverished, little or no manure being here applied to the fields. But for the large amount of virgin land that is every year being brought under the plough the effects of this impoverishment would be more apparent. Three-fourths of the wheat planted in California is of the Chilian and Australian varieties, balance mostly Mediterranean and Sonoran. California wheat is noted for its many desirable qualities. The berry is apt to be plump, weighing rarely less than 60 pounds to the bushel, usually more—often as much as 63 or 64 pounds. It has much strength, containing a large proportion of gluten. For this reason it absorbs water freely in its preparation for the oven, and is liked by bakers, as it gives weight to the loaf. Owing to its extreme hardness and dryness, it can be stored or shipped in bulk without liability to heat or sweat, hence it is well adapted for long voyages and use in warm climates. These properties also recommend it to millers abroad for mixture with the damp wheat of other countries. As a general thing, California wheat commands higher prices than any other in foreign markets. Home prices reach within a fraction of those ruling on the Atlantic seaboard.

Next to wheat, barley is the cereal most cultivated in California, though proportionately less is raised now than formerly, when it was largely used for horse-feed. At present the bulk of this grain is malted, either at home or in the countries to which it is exported. Being more certain and prolific than wheat, barley is apt to be a profitable crop. The product of the State for 1881 amounted to 1,500,000 centals against 5,000,000 the preceding year. The quantity exported is variable, ranging from 10 to 30 per cent. of the entire crop; principal places of destination, New York, Liverpool, Australia, and British Columbia, with a little to Central America, Mexico, and Japan. Home prices vary from $1 to $1.60 per cental.

California raises comparatively little rye, oats, buckwheat, or Indian corn—not enough, except of corn, for home consumption; oats being imported from Oregon; rye and buckwheat, in the form of flour, from the Atlantic States. Oats are a sure crop and yield well—on an average 30 bushels to the acre. Much of the crop is cut while green for hay. The meal ground from California-grown oats is inferior to the imported article. Corn can be cultivated to advantage in a few favored localities only, as in the Russian River Valley and on the El Monte, Los Angeles co., the cool nights and summer droughts retarding its growth. The most of the rye produced is grown on the lighter soils and along the foothills of the Sierra Nevada, where it is a tolerably sure but not very prolific crop, yielding only about 15 bushels to the acre. Buckwheat thrives fairly in many parts of the State, but for some not very obvious reason but little is raised. Although no rice, except in an experimental way, has been grown in California, the trials made establish that this grain could be successfully cultivated on the tulé-land of which the State contains so much. That rice-planting has not as yet been undertaken is due to the fact that all needed supplies can be obtained from China and Japan below the cost of home production. The receipts of this commodity at the port of San Francisco are heavy, the large Chinese population in the country subsisting mainly upon it.

Of the more common vegetables, such as potatoes, turnips, beets, carrots, onions, etc., great quantities are raised, these growing readily and with but little care wherever supplied with enough moisture whether from natural or artificial sources. The leguminous plants, requiring less moisture, are easily grown almost everywhere; so also pumpkins and melons do well on rich and loamy soils. While the California potato lacks good qualities, melons are, as a general thing, excellent, though these too, where irrigation is practised, are often watery and of poor flavor. The potato crop of California averages about 800,000 sacks; onions, 75,000 sacks; beans, 230,000 centals, raised mostly in the southern counties. From 10 to 20 per cent. of these several products, and about the same proportion of various other kinds of vegetables, are exported, mostly to British Columbia and the Hawaiian Islands.

The mulberry tree grows rapidly and yields an exuberant foliage. In one year from the planting it affords much suitable food for the young silkworms, and in three years is fit for regular cropping. Several million trees are growing in the State, with additional plantings every year. The production of silkworm eggs is already large, but, being in demand abroad on account of their freedom from disease, many have been sent to France, Italy, and other silk-growing countries, restricting worm-raising and the consequent production of the fibre; of the latter, however, enough is made to supply the two factories engaged in spinning thread and weaving fabrics out of the silk reeled from California cocoons. These establishments employ a total of 150 hands, and work up 30,000 pounds of the raw material annually. Two crops of cocoons are raised here in the course of the season—one in May and the other in July. The insects, being spared the thunderstorms and cold rains of most other countries, prove here vigorous and prolific workers. That hemp and flax could be successfully grown here would be inferred from the fact that a wild species of both is indigenous to the State. Flax is to some extent cultivated, but only for the seed, no use having yet been made of the fibre. Experiments made with jute and ramié hemp establish that these plants could be grown to advantage on any of the moist bottom-lands of the State, the stalks raised being vigorous and heavily coated with a strong fibre. Several mills have been erected in the State for expressing linseed, castor, and other vegetable oils. Cotton-growing, except in an economic view, can no longer be considered a problem in California, small quantities of this article having been raised in the State for the past ten years. In some instances the crop has been profitable, and in others the reverse; all that can be claimed for these pioneer efforts being that they establish the fitness of the soil and climate for the culture of this plant. To ensure a crop irrigation is necessary, unless the planting be on tulé or other naturally moist lands. The hop-vine in California is noted for its rapid growth and great fecundity, the plant reaching maturity in three years, and yielding at the rate of 1500 pounds to the acre. Matured with little rain and cured mostly in the sun, the fruit retains its natural fresh color and is rich in resinous lupuline. The hop is never injured here by mildew, untimely frosts, or the occurrence of rain during the picking and drying season, the fruit being so nearly cured on the vine that brief exposure to moderate artificial heat completes the process. The average crop of California amounts to about 16,000 bales, of which a little over one-half is exported. The culture of tobacco has been tried in California, but not with such results in quality as to lead to its rapid extension. The growing season being long, the yield is large, averaging 3000 pounds of cured chewing and 2000 pounds of cigar-leaf to the acre. The complaint is of "rankness," due probably to the heat and dryness of the summers. Cranberry-culture has been tried, but as yet without profit. Chiccory can be grown, but it is inferior to the imported German article.

For three or four years during the late Civil War, which prevented the export of turpentine and rosin from North Carolina, enough of these articles was made in California for home consumption. At the restoration of peace they were again obtained from North Carolina. Twenty-five or thirty years ago, before ploughing became general, the Coast Range, with some portions of the larger interior valleys, was covered in the season of verdure with wild mustard, standing so tall and thick that a horseman riding through it was completely hidden from view. Considered worse than worthless, as it interfered with ploughing and obstructed the growth of both grass and grain, it became one of the standing plagues of the farmer. After some time, however, the seed began to be ground for table use, and being found a superior condiment, great quantities were gathered. Latterly, it has come to be further utilized for the rich oil it contains, much of which is now expressed, it being by many preferred to the best lard or olive oil. Since the disappearance of the wild plant before extensive and frequent ploughing, it has to some extent been cultivated to meet the demand that has grown up for its seed.

Fruits, Nuts, and Berries.—The capabilities of the State in this department of production are such that many intelligent observers are of opinion that her orchards, gardens, and vineyards will ultimately become sources of greater enrichment than either her mines or her cereal crops. In addition to the great vineyards mentioned, many others nearly as large might be instanced, the total number of grapevines set out in the State, three-fifths of them bearing, being estimated at 80,000,000. It is expected that the product of wine, which of late years has averaged 10,000,000 gallons annually, will be greatly augmented in the immediate future, recent plantings having been very extensive. Of the entire quantity made, a large proportion goes into the cellars for ageing, about 2,000,000 gallons being exported annually, the most of it to the Atlantic States. Besides wine, many raisins and large quantities of brandy are made from the grapes. Much of the California wine contains too large a percentage of alcohol to suit the taste of most foreigners, but of late years such improvement has been made in the manufacture as to bring many kinds into more general commendation and partially reversed the earlier unfavorable opinions of the connoisseurs.

The apple was among the first of the fruit trees largely cultivated. Few varieties, however, keep well, and but little fruit is made into cider. The native-grown fruit is not, in fact, so solid or well-flavored as that raised in the easterly half of the continent, though the apples produced in the mountainous districts are not noticeably defective in this respect, there being some varieties that keep nearly the year round. The apple trees number several millions in the State; the peach, pear, and apricot count each a still larger number; the orange, lime, lemon, plum, quince, prune, and cherry are not so numerous. Of fruit trees generally it may be said that they grow rapidly and bear abundantly, and much earlier than in most other countries. The fruit, except in localities not adapted to the particular kind raised or where excessive irrigation is practised, is generally good, much of it being noted for its excellence. This class of trees, the vine included, has thus far enjoyed almost entire immunity from the many diseases, insects, and other pests that assail them in most other parts of the world. The olive, fig, citron, and pomegranate are grown, some of them quite extensively. The banana and some other heretofore accounted purely tropical plants have been set out in the southern part of the State, where they mature their fruit with a perfection not expected. On the list of nut-bearing trees we find the almond, madeira, chestnut, butternut, English walnut, and some others—all being grown with a good prospect of success, some with present profit. The hickory and the beech are not among the native nuts of California, these trees refusing to become domiciled in the State. The more lowly peanut, accepting naturalization, thrives with little care, hardly ever failing to produce an abundant crop. Currants and berries of nearly every kind also grow readily, great quantities being raised all over the State. They are a profitable crop, bringing good prices and being long in the market. Strawberries are to be had every month in the year, and are plentiful for four or five months, beginning with April; other berries for about three months, beginning in June. The strawberry and blackberry are hardly equal to those raised in the East; other kinds, currants included, are not surpassed elsewhere. Large shipments of grapes and early green fruits are made eastward by rail every year; immense quantities of fruits and berries are also dried, some for export, but more for home consumption. Much attention is now being given to tree-culture in California, large groves, mostly of the blue gum or eucalyptus, having been set out in the interior valleys and in the coast counties. This tree grows rapidly, reaching in good soils as large a size in seven years as in twelve in most other places. The sugar-beet is planted on quite a large scale in California; also sorghum to a less extent. Both do well in suitable localities, the product of the former in 1881 being set down at nearly 1,500,000 pounds. This vegetable grows here to a large size, and is rich in sugar. Being left in the ground until wanted for milling, it keeps on growing all winter. By this plan the chemical changes that through storage work a considerable loss of the saccharine matter are avoided, also the trouble of a second handling. In a country where the use of sugar is so large it is of economic importance that requirements be met as far as may be from domestic sources of supply. Of the total receipts of raw sugars at the port of San Francisco in 1881, amounting to 115,432,360 pounds, 93,289,184 pounds were consumed on the Pacific coast, being at the rate of more than 50 pounds of refined sugar to every inhabitant of that region. There are three large sugar-refineries in San Francisco, one of unusual capacity; also, works elsewhere in the State for the manufacture of beet-sugar.

Dairying, Stock-raising, Wool-growing, etc.—For several years past the annual make of butter in California has been between 8,000,000 and 9,000,000 pounds, cheese between 4,000,000 and 5,000,000 pounds. The number of milch cows kept in the State is estimated at 50,000, producing about 170 pounds of butter each per year. These cows consist of American and Spanish breeds, so crossed with blood animals that the poorer points of the original stock have mostly disappeared. Dairying has been a profitable business in California, land suitable for carrying it on being cheap, while butter and cheese have always commanded high prices and a ready market, though neither is as good as the article made in the Eastern States and England. Cows here receive no shelter and but little fodder—none except for a short time in the winter or in seasons of extreme drought. At all other times the cows, and often also the work-oxen, are left to feed on the natural grasses, which, though very nutritious, do not, when once eaten off, grow up again the same season; wherefore a large area of ground, from five to ten acres, is required for the subsistence of each cow. The importation of butter and cheese into California, once very large, has for the past ten years nearly ceased, these articles of home production being now exported freely to other countries, mainly to the Hawaiian Islands, China, and Japan.

The number of neat cattle in California does not now exceed 800,000, being one-fourth less than it was twenty years ago. The reason of this is that much land once devoted to the grazing of stock is now cultivated to grain or given up to sheep-raising. Besides, the business of raising cattle for the shambles is not so profitable now as formerly, much beef and many live animals being brought into the State from Nevada by rail, creating a competition that works to the detriment of the California stockmen. But few oxen are used in California, most draught animals consisting of horses and mules, of which there are about 250,000 in the State. The horses are mostly a mixture of American and Spanish, improved by better breeds, there being many pure-blooded animals in the State. Swine-raising, never a popular or very profitable industry in California, has been on the decline for some years past, these animals numbering only about 400,000 in the State, a third less than twenty years ago. There are peculiar difficulties in the way of growing these animals here: the hot, dry summers do not suit their habits, causing also a lack of succulent food, while mast is scanty, and corn, the great swine-food of the Western States, is scarce and dear. Producing comparatively little hog-products, these are largely imported into the State. California being a tolerably good poultry country, domestic fowls of all kinds are raised in large numbers.

The honey-bee, prior to 1853 a stranger in California, has, since its introduction at that time, multiplied and spread amazingly, there being now over 40,000 hives in the State, besides hundreds of swarms that, escaping, have scattered all over the country. The insect here is very prolific, as well as a great worker and storer, increasing and making honey twice as rapidly as in the Atlantic and Western States. Except in the higher mountains the insects can hardly be said to hibernate at all. They gather and lay up nearly as much in winter as in summer, consuming more of their hoard in the warm, dry weather than at any other time. In this land of sunshine and fruits and flowers the bee works with but little interruption, and is never without food; even on the deserts it finds in the wild sage abundant and acceptable pasturage. For excellence California honey is probably unequalled, and, being so cheap and abundant, no adulteration is practised in putting it up for market. Bee-culture has a great future in this State.

According to the census returns of 1880, California contained then 4,152,349 head of sheep, being 15 per cent. of the entire number in the country, and constituting her the largest sheep-breeding State in the Union. The annual wool-clip of California has for several years past ranged from 43,000,000 to 56,000,000 pounds, of the average value of $8,000,000. The difference in the prices of wool, as of most other staples, between the Atlantic and the Pacific seaboards consists in cost of freights and charges incident to transportation between these two points.

Manufacturing Industries.—The bulk of the manufacturing in California is carried on in and around the city of San Francisco, not much, except in a few lines, such as making lumber, flour, agricultural implements, etc., being done elsewhere in the State. According to the returns of the Census Bureau for 1880, San Francisco stands tenth on the list of manufacturing cities in the United States as regards value of products and aggregate of yearly wages paid, though she heads the list in the average yearly wages paid workmen, which amount to $522, against $481 paid by Pittsburg, the next highest on the list. By the same authority the number of manufacturing establishments in San Francisco is 2860; capital invested, $29,417,246; employés, 26,062; value of raw materials, $44,537,430; value of products, $71,613,385; net earnings on capital invested, less rents, taxes, insurance, etc., $12,480,945. Sugar-refining and the manufacture of beer and malt liquors, amounting annually to $10,000,000 more, are omitted from the above calculation, the leading industries represented therein being as follows:

	Material.	Products.
Meat-packing	$4,511,721	$6,013,602
Boots and shoes	2,187,811	4,141,547
Clothing	2,863,300	4,933,170
Carpentering	1,690,833	3,121,851
Flour, etc	1,999,613	2,310,209
Furniture	683,895	1,280,210
High explosives	680,416	1,565,868
Iron castings	651,823	1,311,743
Leather	1,607,498	3,116,820
Machinery	1,325,444	2,577,760
Printing	1,615,305	2,987,576
Tobacco and cigars	1,929,357	3,728,813
Soap and candles	676,489	886,293
Tin, copper and sheet-iron ware	542,041	949,499
Upholstering	208,032	360,332
Fruits and vegetables	609,000	978,000
Furnishing goods	509,540	744,245

Besides the above-enumerated branches of business, a great variety of minor pursuits and callings are actively carried on in the city, the list below embracing the more important of these: Yearly value of cigar and other boxes made, $600,000; brass castings, $374,000; bread and crackers, $2,070,000; bags other than paper, $1,565,000; gloves, $191,000; dressed furs, $224,400; glass, $103,000; hats and caps, $83,678; ink, $97,000; jewelry, $315,115; looking-glass and picture frames, $281,000; marble-work, $469,646; matches, $198,600; millinery and lace goods, $456,300; painting and paper-hangings, $639,503; perfumery, $61,900; photographing, $298,960; saddles and harness, $400,715; sash, doors, and blinds, $769,030; shirts, $303,000; straw goods, $85,000; trunks, $166,000; watch and clock work, $223,215—the value of these articles aggregating over $9,000,000. Considerable quantities of acids, axle-grease, brooms and brushes, cocoa and chocolate, casks and barrels, fireworks, hose and belting, lead pipe and shot, maccaroni and vermicelli, saws, wooden and willow ware, yeast powders, etc., are also made in the city.

The commerce of San Francisco, already large, is growing rapidly. Over 500 vessels, nearly all large-class, leave that port annually, the grain-fleet alone carrying away 1,000,000 tons of wheat every year. Outgoing ships hardly ever fail to secure freights, loading with grain, wool, wine, lumber, teas, sugars, provisions, ores, minerals, metals, etc., and bringing back coal, iron, petroleum, and general merchandise, the value of imports and exports amounting to over $150,000,000 annually.

Census Statistics of 1880.—The following additional statistics are derived from the census of 1880: There are 52 counties, the largest in population being San Francisco, with 233,959 people, and the smallest Alpine, with 539. The land-area of the State is 155,980 square miles, this being second only to that of Texas (262,290). The total water-surface within the State is 2380 square miles. The largest county, in area, is San Bernardino (containing a great breadth of desert land in the extreme southern section of the State), with 23,000 square miles, it being equal to the united area of Massachusetts, Vermont, and Connecticut. The bodies of water within the State are reported as having the following area in square miles: Clear Lake, 60; Eagle Lake, 42; Grove Lake (partly in Oregon), 201; Honey Lake, 94; Keni and Buena Vista Lake, 44; Little Klamath Lake (partly in Oregon), 73; Middle Lake, 47; Mono Lake, 84; Owen's Lake, 115; Tahoe Lake (partly in Nevada), 135; Tulare Lake, 650; Upper Lake, 61; Wright Lake, 14. Of the total population, 262,583 were males twenty-one years old or over (this being an unusually large proportion, partly due to the fact that the Chinese element is nearly all adult males). Of this number, 135,209 were natives and 127,374 foreign born, while 66,809 (partly native negroes and Indians, but chiefly Chinese) were returned as colored. There were in the State 177,508 families and 161,037 dwellings, the average number of persons per square mile being 5·54, and the average of persons in a family 4·87. The yields of the principal agricultural products were:

Crops.	Acres.	Production, bushels.
Barley	586,340	12,579,561
Buckwheat	1,012	22,307
Indian corn	71,781	1,993,325
Oats	49,947	1,349,271
Rye.	20,281	181,681
Wheat	1,832,829	29,017,707
Tobacco	84	73,317 lbs.

The numbers of the several kinds of live-stock were as follows (ranch stock not being reported): Horses, 237,710; mules and asses, 28,343; working oxen, 2288; milch cows, 210,078; other cattle, 451,941; sheep, 4,152,349; swine, 603,550. The manufactures of the State made the following exhibit: Number of establishments, 5885: capital employed, $61,243,784; average number of hands employed—males above sixteen years, 38,317, females above fifteen years, 4022, children and youths, 1460; total annual wages paid, $21,070,585; value of materials consumed annually, $72,607,709; annual value of products, $116,227,973. In the particular manufacture of salt there were 25 establishments, producing by solar evaporation of sea- and bay-water, with a capital of $365,650, employing an average of 184 hands, and having an annual product of 878,443 bushels. There were employed in the fisheries 3036 persons, with 853 boats and 46 vessels. The annual product of the several fisheries was as follows: (1) Shore and halibut fisheries, 8,516,000 pounds of fresh fish, valued at $371,746; crabs and shrimps, 2,500,000, valued at $66,358; oysters, mussels, abalones, etc., valued at $128,250; whale oil, 37,135 gallons, valued at $20,210; fish oil, etc., 6400 gallons, valued at $2000; seal-skins, 2000, valued at $10,000; sea-otter skins, 75, valued at $3750; eggs of sea-birds, 120,000, valued at $1500; sea-weed, 250,000 pounds, valued at $200; (2) cod-fishery, 4,721,920 pounds of fresh fish, valued at $196,870; (3) salmon-fishery, 11,340,000 pounds of fresh fish, valued at $181,010; (4) whale-fishery, 116,550 gallons of whale oil, valued at $59,440; 61,000 pounds of whalebone, valued at $122,000; (5) oyster-fishery, 125,000 bushels of oysters, etc., valued at $575,000.

The number of manufacturing establishments in the State was (census of 1880) 5885, with a capital of $61,243,784, employing hands as follows: Males, above sixteen years of age, 38,317; females, above fifteen years, 4022; children and youths, 1460. The total amount of wages annually paid was $21,070,585; the value of materials annually consumed, $72,607,709; and the annual value of products, $116,227,973.

The chief towns and cities had a population as follows: Oakland, 34,555; Los Angeles, 11,183; Sacramento (capital), 21,420; San Francisco, 233,959; Stockton, 10,282; San José, 12,567; Vallejo, 5987; Marysville, 4321. (H. D.)

CALVARY is the name commonly given to the place of the crucifixion of Christ. (The four Evangelists in their narratives of this event all use the word *κρανιον*, skull—not as a proper name, but as the interpretation of the Hebrew word, *Golgotha;* and in the Vulgate it is uniformly translated *Calvaria*. The word "Calvary," formed from this, is used in the English Authorized Version only in Luke xxiii. 33, while in the other Gospels it is translated "the place of a skull." The Revised Version of 1881 translates the term in Luke as elsewhere, while the Rhenish (or Douay) Version, as might be expected, everywhere uses Calvary as a proper name.) The place was without the walls of Jerusalem, probably on the north-west side, and seems from the manner in which it is mentioned to have been the usual place for the execution of criminals. The name may indicate that it was a hillock, bald and skull-like, but nothing else in the original shows that it was a mount, although the expression *monticulus* was applied to it in the fourth century; and this belief has since prevailed throughout Christendom. Early ecclesiastical historians assert that the empress Helena, A. D. 326, found the exact spot of the crucifixion, and caused the Church of the Holy Sepulchre to be so built as to include Calvary. This church is within the modern city, but its site was outside the walls in the time of Christ. The manifest improbability that the place of the crucifixion and the tomb of Joseph of Arimathea should be so near to each other has caused many modern investigators, Catholic as well as Protestant, to deny the correctness of the tradition, and the question of locality is not yet fully decided. Mr. J. Fergusson, a distinguished architect, in his *Essay on the Ancient Topography of Jerusalem* maintains that the present Church of the Holy Sepulchre has been built since the Crusades, and that the Mosque of Omar, called by the Mohammedans "The Dome of the Rock," is the church erected by the empress Helena. Lieut. Conder, a more recent explorer, inclines to place Calvary outside the modern walls at the grotto of Jeremiah.

The name "Calvary" is also given in Roman Catholic countries to hills on which crosses are raised, that pilgrimages may be made to them during Holy Week. The most famous of these was at Mont Valérien, near Saint-Cloud, which was a favorite resort for pilgrims from Paris in the seventeenth century, until, on account of increasing disorder, the practice of this pilgrimage was forbidden by the archbishop in 1697. The religious order of the "Priests of Calvary," connected with this place, continued till the French Revolution.

CALVERT, the largest town in Robertson co., Texas, is on the Houston and Central Texas Railroad, 6 miles E. of the Brazos River and 120 miles N. of Houston. It has a bank, a weekly newspaper, eight churches, an academy, and other schools. Calvert ships 20,000 bales of cotton annually. Population, 2280.

CALVERT, Cecil or Cæcilius, second Lord Baltimore, a son of the first baron of that title, was born about 1603, and succeeded to the titles of his father in 1632. He at once determined to carry out his father's design for the colonization of Maryland. For this purpose he fitted out two vessels, the Ark and the Dove, and collected a body of 200 English Cavaliers, largely Catholics of fortune and family. The expedition sailed from the Isle of Wight on Nov. 22, 1633, under the command of Leonard Calvert (1606–1617), whom his brother, the lord proprietary, had appointed governor of Maryland. The leader of the new colony was only twenty-six years old, but he united in a remarkable degree a daring spirit with the wisdom of age. The voyage was prosperous, and on Feb. 24, 1634, the vessels entered Chesapeake Bay. The colonists were kindly received at Jamestown by the governor of Virginia, who entertained them several days. On March 3 they sailed up the Chesapeake, and spent three weeks in exploring the rivers of Maryland. On March 25 they landed, planted the cross, and took possession of the country "for our Saviour and for our sovereign lord the king of England." The Indians were conciliated by the peaceful behavior of the colonists, and a treaty was formed between them. Gov. Calvert purchased from the Indians all the land for the new settlement, and Maryland is one of the few States whose early history was not stained with the blood of the natives. The first settlement was made at St. Mary's, on the Potomac, and it is simple justice to say that this little spot by the Chesapeake was the only home which religious liberty then had in the whole world. The liberality of the government to persons of all Christian sects induced emigration not only from England and the neighboring colonies, but also from Scotland, Ireland, Wales, Sweden, France, and Germany. In 1642, Gov. Calvert visited England to consult with his brother about the affairs of the colony. Lord Baltimore had adhered to the royal cause, and joined Charles I. at Oxford after the Parliamentary party had established its power in London. After the execution of the king and the establishment of the Commonwealth, Lord Baltimore submitted to the government of Cromwell. When Gov. Calvert returned to Maryland in 1644, he found the colony divided into two factions, as in the mother-country. Clayborne, the treasurer of Virginia, who had years before established a trading-post on Kent Island, within the limits of the Maryland grant, raised a band of desperate men, and, with the aid of Capt. Richard Ingle, obtained complete possession of the province, and held it for two years, during which time they plundered the people without mercy. Gov. Calvert took refuge in Virginia during the usurpation of Clayborne, and began to collect a force for the subjugation of the outlaws. In April, 1646, at the head of a small force, he crossed the Potomac, surprised the enemy, and after an almost bloodless victory regained possession of the government and restored peace to the distracted colony. On April 16, 1647, he issued a proclamation granting pardon to all who had been engaged in the late rebellion, and on the 9th of June of the same year he died at St. Mary's. Cæcilius Calvert survived his brother twenty-eight years, and died on Nov. 19, 1675. He spent £40,000 out of his private fortune during the first two years of the colonization of Maryland in transporting settlers, stores, and provisions to the new province. He married Anna, daughter of the earl of Arundel, a Catholic nobleman.

Calvert, Charles, the third Lord Baltimore, was a son of Cæcilius. He had been appointed governor of Maryland in 1662, and resided several years in the province, administering the affairs of the colony with justice and ability during a period of great danger. He married, in Maryland, Jane, the widow of Henry Sewall, and lived for three years at Mattapanny-Sewall, near the mouth of the Patuxent River. After the death of his father he visited England, but returned to the province in 1680. During the next three or four years he held several conferences with William Penn in order to arrange the disputed boundary of Maryland and Pennsylvania, but they failed to arrive at any satisfactory settlement; nor was the dispute finally arranged till the year 1760, when Frederick, Lord Baltimore, and Richard and John Penn signed terms of agreement. Until 1684 the lord proprietary, Charles, Lord Baltimore, governed the province in person, but in that year he left Maryland, never to see it again. He died on Feb. 20, 1714, at the age of eighty-four. He was succeeded in the title and estate by his son, **BENEDICT LEONARD**, who survived his father only one year. Benedict's son, **CHARLES**, the fifth Lord Baltimore, held the title for thirty-six years, during which time the population of Maryland rapidly increased and the colony enjoyed prosperity. Several new counties were formed and the city of Baltimore was laid out. The fifth Lord Baltimore died in 1751, and was succeeded by his son **FREDERICK**, the last Lord Baltimore. He was a man of pleasure, a fashionable young nobleman of the time of George II. Occasionally, however, Frederick aroused himself from his pursuit of pleasure and attempted something more worthy of his birth. In 1767 he published a *Tour to the East*, of which Horace Walpole said, "His bills on the road for post-horses would deserve as much to be printed. His book proves a well-known truth—that a man may travel without observation and be an author without ideas." Two years later he published *Gaudia Poetica*, a volume of prose and poetry, "very scarce and very stupid." In 1771 he published another book, *Cœlestes et Inferi*, and the same year he died, "a worn-out old man at the age of forty." With Frederick the title of Lord Baltimore became extinct. He bequeathed the proprietaryship of Maryland to his natural son, Henry Harford, who enjoyed its revenues until the American Revolution placed the State government in the hands of the people. He received from the British Government compensation to the amount of £90,000 as an indemnity for the loss sustained by him by the separation of the colonies from the mother-country.

The present Maryland Calverts are descended from Charles, fifth Lord Baltimore. The descendants of Benedict Calvert, a natural son of Charles, are quite numerous in Maryland. Benedict's daughter married Mrs. Washington's son, John Parke Custis.

CALVERT, GEORGE HENRY, a great-grandson of the fifth Lord Baltimore, was born in Baltimore, Jan. 2, 1803. His mother was a descendant of the painter Rubens, and was a native of Antwerp. After graduating at Harvard in 1823 he studied at the University of Göttingen, and on his return to Maryland became editor of the *Baltimore American*. He has published many works, including translations, dramatic poems, and criticisms. He was the author of the first American work on phrenology (1832), and among his translations are a metrical version (1836) of Schiller's *Don Carlos* and a part of the correspondence between Goethe and Schiller (1845). He also published *Scenes and Thoughts in Europe* (2 vols., 1846, 1852; new edition, 1865). His most popular book is *The Gentleman* (1863), which evinces much curious and out-of-the-way scholarship. All of his writings are marked by a fastidious taste. He has occasionally contributed to the *North American Review*, *Putnam's Monthly*, and other literary periodicals. Since 1843, Mr. Calvert has resided at Newport, R. I. Among his later works are *Ellen, a Poem* (1869), a *Life of Goethe* (1872), and four volumes of poetry, published in 1883.

CAMDEN, the county-seat of Kershaw co., S. C., is on the east bank of the Wateree River, which is navigable for steamboats to this point, 32 miles N. E. of Columbia and 115 miles N.N.W. of Charleston. It is the terminus of the Camden branch of the South Carolina Railroad, and another railroad to the town is now under construction. It has a courthouse, two hotels, two high schools, several academies and common schools, and four churches for whites and two for colored people. Many of the inhabitants are descended from the original Quaker colony, as well as Scotch-Irish settlers of later date and refugees from Virginia after Braddock's defeat in 1755. There is good water-power in the vicinity, and the trade of the town exceeds $1,000,000 annually. It ships 20,000 bales of cotton, besides naval stores and rice. Population, 1780. During the Revolutionary War it was a local centre of military operations, and in the immediate vicinity were fought two important battles between the Americans and the British—one in August, 1780, and the other in April, 1781.

I. In the former the British force was stationed at Camden under Lord Rawdon, who forced every available man into the service, and was joined by his superior, Lord Cornwallis, with reinforcements from Charleston. The cavalry consisted chiefly of Tarleton's legion, the commander of which was already noted for his intrepidity and cold-blooded cruelty. The American general, Lincoln, had been relieved from the command of the Southern army after his surrender of Charleston to Sir Henry Clinton, and Gen. Horatio Gates had been appointed, without consulting Washington. His success at Saratoga had so elated him that it was thought proper to caution him against rashness in his new command. The sequel proved that the caution was necessary. He advanced upon Camden with 4500 men, chiefly militia from North Carolina, Maryland, Delaware, and Virginia. He had very little cavalry. His march was unimpeded as far as Clermont, near Rugeley's Mill, a few miles north of Camden. On the 15th of August, having taken unusual precaution, he moved rapidly forward with the intention of surprising the British at Camden, but by a singular coincidence at the same time Cornwallis and Rawdon advanced in the hope of taking him by surprise. Thus the vanguards of the two armies came upon each other about half a mile north of Saunders's Creek, midway between Clermont and Camden. Both fired at the same moment, and the American advance fell back upon the main column in disorder. After some skirmishing there was a pause, and as a retreat was still practicable, while there was great uncertainty as to the result of a battle—the enemy not having been surprised according to Gates's intention—he called a council of officers. It was decided to fight, and the officers returned to their posts. The British army was in line of battle, the right under Lieut.-Col. Webster, and the left under Rawdon. The Americans, recovering from their surprise, also formed their line, the Maryland and Delaware troops under Col. Gist forming the right, the North Carolina militia under Caswell the centre, and the Virginians under Gen. Stevens the left. Both armies waited for the dawn, and with its first beams the battle began. For a time the struggle was nearly equal, but the militia, charged by British bayonets in front and by Tarleton's cavalry in flank, gave way, and the retreat became a rout. Tarleton pursued them, and for two miles the road was strewed with dead and dying, arms, artillery, ammunition, and baggage. The American loss was about 1000; that of the British, 325. The brave Baron de Kalb, a German officer who had been trained in the French service, and had been made a major-general in the American army, fell with eleven wounds. He had displayed great coolness and courage, and his troops were the last to give way. A monument has been erected to his memory at Camden, the corner-stone of which was laid by La Fayette in 1825. A short time after the battle Gen. Gates was relieved by Gen. Greene and brought before a court of inquiry, which acquitted him, but he was not restored to his military command until after the surrender of Cornwallis at Yorktown.

II. The situation of Gen. Greene was one demanding skill, boldness, and fortitude. He was in close proximity to a victorious enemy, and while maintaining his position he succeeded in effectively covering the roads by which supplies and reinforcements must reach him. In March, 1781, he was in North Carolina, and on the 15th he had met Cornwallis in battle near Guilford Courthouse, where, after two hours' fighting, the Americans had been repulsed, but had retired in good order, while the British force had been greatly shattered, and was glad to find a resting-place at Wilmington. Greene, soon recovering from the effects of the action, was ready for a daring advance into South Carolina to beat up the quarters of Lord Rawdon, who had been left in command at Camden with about 900 men. He began this march on the 6th of April, and on the 19th he encamped at the base of Hobkirk's Hill, where he was less than a mile from Rawdon. The position was a strong one; the country was thickly wooded in his front, while on his left flank and rear was a marsh. On the 25th of April, through an unexplained negligence, the Americans were again surprised. The men were without their accoutrements; some were washing their clothes. The cavalry horses were unsaddled, and Greene and his officers were at breakfast, when Rawdon's advance fell suddenly upon his pickets, less than a quarter of a mile in his front. Fortunately, their fire checked the enemy's advance until the American line could be hastily and somewhat imperfectly formed. The Virginia brigade formed the right, under Gen. Huger. The Maryland brigade, under Cols. Williams and Gunby, the left; Col. Harrison, with the artillery, was in the centre. The reserve consisted of 250 North Carolina militia under Col. Reade. So confident was Greene of success that he had ordered Col. Washington with his cavalry to turn the enemy's left and fall upon his rear. The Americans withstood the first compact charge so well that the enemy wavered. Greene led the Virginia regiments in person, but the Maryland line gave way on the death of one of its leaders, Lieut.-Col. Ford, and it became necessary to retreat: this was done in good order until they reached the north side of Saunders's Creek. The charges of Col. Washington checked the pursuit, and he even succeeded in capturing a number of prisoners, many of whom escaped, but 50 of whom were brought into camp. Again the British were unable to profit by their apparent success, and were obliged to fall back upon their works in Camden. Soon after Rawdon set fire to Camden and retreated. Greene again advanced, capturing several of the enemy's field-forts, and thus his partial defeats were turned into substantial successes. The American loss in this battle was 266; the British, 258. (H. C.)

CAMERON, Simon, an American Senator and politician, was born in Lancaster co., Pa., March 8, 1799. At the age of nine he was left an orphan, and a few years later began to learn the printer's art. In 1820 he became the publisher of the *Pennsylvania Intelligencer* at Doylestown, Pa., and about a year later removed to Harrisburg, where he edited a Democratic paper strongly advocating the claims of Gen. Jackson to the Presidency. He engaged in business in various directions, and acquired a reputation as a shrewd and careful manager. In 1832 he established the bank of Middletown under the State law. Under Gov. Shultz's administration he was adjutant-general. In 1845 he was elected U. S. Senator to fill the vacancy caused by the resignation of James Buchanan, and served till 1849. He supported the annexation of Texas and the war with Mexico. During the agitation of the question of slavery in the Territories he favored the extension of the Missouri compromise line to the Pacific, and when finally this compromise was repealed he became a Republican. In the Chicago convention of 1860 he had the third highest vote on the first ballot for the nomination as President, but his name was afterwards withdrawn. When Pres. Lincoln entered on the duties of his office in March, 1861, he appointed Mr. Cameron Secretary of War. Owing to the disloyalty of many previously connected with that department, its affairs were in a chaotic state at a time when greater demands were made upon it than ever previously in the history of the country. Mr. Cameron labored energetically to secure success to the Union army, and favored the most vigorous prosecution of the war, urging the necessity of striking at slavery as the root of the evil and stronghold of the enemy. He resigned his position Jan 13, 1862, and was appointed minister to Russia. Within a year he returned to the United States, and in 1864 was a delegate to the Republican convention at Baltimore at which Lincoln was nominated for a second term. In Jan., 1867, he returned to the United States Senate, and was thenceforth conspicuous for his domination of his party in Pennsylvania. Pres. Grant, who at first held aloof from Senator Cameron, was obliged to recognize him as a political leader, and eventually did much to increase his power. In Feb., 1871, when Senator Sumner was removed from the chairmanship of the committee on foreign affairs for personal reasons, Mr. Cameron was chosen to succeed him, and remained in that position till the close of Pres. Grant's administration. He then resigned his Senatorship, securing the election of his son, Mr. J. Donald Cameron, to fill the vacancy.

CAMERON, Verney Lovett, C. B., an English explorer, was born at Radipole, near Weymouth, June 1, 1844, of an ancient Scotch family. He entered the British navy in 1857, and served in the Mediterranean, in the Red Sea, and upon the eastern coast of Africa, where he took part in the Abyssinian campaign as senior lieutenant, and was subsequently engaged in efforts to suppress the slave-trade. During this service he studied the language of the natives of Zanzibar, and was chosen by the Royal Geographical Society of London in 1872 to conduct an expedition for the relief of Livingstone and to aid in his explorations. His journey was the first ever made across Equatorial Africa. (It is described in the article AFRICA, pp. 55. 56.) He returned to England in April, 1876, where he was received with great enthusiasm, was made companion of the Order of the Bath, and received the great gold medal of the Geographical Society, and a similar medal from the Geographical Society of Paris. In February, 1877, he re-entered the English naval service. In 1878 he set out upon a new journey of exploration, through Asia Minor and Persia, his object being to determine whether a railroad might be built from the Mediterranean to India without following down the Euphrates Valley. He has published a translation of Admiral Butakow's *Nouvelles bases de Tactique navale* and an original memoir on *Steam Tactics*. He has described his African journey in an interesting work entitled *Across Africa* (1877), and his later exploration in *Our Future Highway to India* (2 vols., 1880).

CAMPBELL, Alexander (1788-1866), an American theologian and educator, the most prominent leader of the religious denomination called "Disciples of Christ," was born Sept. 12, 1788, in the county of Antrim, Ireland, but his ancestry belonged to the west of Scotland. His mother, Jane Corneigle, was a descendant of French Huguenots. The strict piety and literary culture of the parents secured for the children great advantages, educational, moral, and religious. Alexander, when a boy, had no fondness for study; his special delight was in outdoor sports. But after a few years of hard work on a farm he began to manifest an eager desire for knowledge, and under his father's guidance made rapid progress in his studies. At the age of seventeen he assisted his father as teacher in an academy at Richhill, a school that soon grew into prosperity. In his youth he joined the Anti-Burgher—a branch of the Secession—Church at Ahorey, to which his father ministered. From this time he gave much attention to theological studies, especially to church history. A church of Independents at Richhill was sometimes visited by men of note, such as Rowland Hill, James A. Haldane, and Alexander Carson, who were heard with great interest by the young theologian. In 1808, Alexander embarked with the family, to join his father in the United States. The vessel was wrecked, however, on the Scottish coast, and the voyage to America was postponed. At the time of the shipwreck Alexander resolved that if his life were spared he would devote himself to the Christian ministry, and he went to Glasgow University in preparation for his chosen work. While pursuing his studies he came into association with a class of religious men, such as Rev. Greville Ewing, Robert and James A. Haldane, whose influence over him, joined with that of his previous studies, led him to abandon the communion of the Seceders. In 1809 he migrated to the United States, and, finding that his father had also forsaken that communion and was engaged in an effort to unite Christians as one communion on a purely scriptural basis, he found himself in readiness to join in this work. In Washington co., Pa., he began labor in behalf of this cause, in connection with the "Christian Association of Washington," which published a *Declaration and Address* in 1809 setting forth the objects of the association. It was proposed to establish no new sect, but to persuade Christians to abandon party names and creeds, sectarian usages, and denominational strifes—which at that time were intense and bitter—and associate in Christian fellowship, in the common faith in a divine Lord, with no other terms of religious communion than faith in and obedience to the Lord Jesus Christ. He began to speak publicly in 1810, and delivered 106 sermons within a year. Circumstances leading to the formation of an independent church at Brush Run on the principles avowed by the Christian Association, he was licensed by that Church to preach, and on Jan. 1, 1812, was ordained. Further investigations of the Scriptures led to the conclusion that immersion only is baptism, and that believers are the only scriptural subjects of that ordinance; and on June 12, 1812, Alexander Campbell and his wife, his father and mother, and three others, were baptized by immersion. In 1813 the Brush Run Church entered the Redstone (Baptist) Association, with a proviso, however, that they should be allowed to preach and teach whatever they learned from the Holy Scriptures. Among the Baptists of the West and South, Alexander Campbell, from his superior learning, oratorical power, and ability as an expositor of Scripture, soon occupied an influential position. In 1817 not more than 150 persons could be counted as entering fully into his views of religious reformation. Meanwhile, he had established a seminary at Buffalo Creek (now Bethany, W. Va.), but whenever he could find release from his duties as teacher he was constantly engaged in preaching. He made it a rule to preach without compensation, lest any should charge him with corrupt motives; and this rule he adhered to all his life. Along with these pursuits he carried on large farming operations, himself performing much of the labor. In 1823 he began the publication of a monthly magazine called *The Christian Baptist*, which continued seven years and obtained a large circulation. In this periodical he unfolded his conceptions of New-Testament teaching concerning the gospel, the order and government of the Church, and the terms of Christian fellowship, and reviewed with much pungency what he regarded as the erroneous teachings of the Protestant sects. In 1830 *The Christian Baptist* was succeeded by *The Millennial Harbinger*, a monthly twice as large and much more comprehensive in its range of discussion. Of this magazine he continued to be editor and principal writer until 1863. The growing influence of his teaching is partly shown by the fact that within the seven years ending with 1829 he issued, of his own works, from his little printing-office at Bethany, no less than 46,000 volumes. Among these (in 1826) he published a translation of the New Testament, by George Campbell, Philip Doddridge, and James Macknight, with various emendations and essays of his own. From 1827 to 1830 there was a gradual widening of the breach between the old Baptists and Mr. Campbell's adherents, which finally resulted in a complete separation. The latter refused to be called by any name except "Christians," or "Disciples of Christ." Now, however, they are frequently called "Campbellites." In 1829, Mr. Campbell was elected a delegate to a convention for the amendment of the constitution of the State of Virginia, where he stood in honorable association with such men as ex-Presidents Madison and Monroe and Chief-Justice John Marshall, and bore no inconsiderable part in originating and discussing the leading measures that occupied the attention of the convention. In 1820 he engaged in a discussion with Rev. John Walker on infant baptism, and in 1823 with Rev. W. L. McCalla on the same subject. In 1828 he debated with the celebrated Robert Owen on the evidences of Christianity. In 1837 he held a debate on Roman Catholicism, at Cincinnati, with Bishop Purcell, which lasted seven days. In 1843, at Lexington, Ky., he debated sixteen days with Rev. N. L. Rice, a Presbyterian minister. Besides these oral debates, his written discussions with Jews, Universalists, Unitarians, Spiritualists, Episcopalians, Presbyterians, Methodists, Baptists, and sceptics cover nearly all the questions of religious doctrine and church polity. In all these written discussions he gave both sides fully in his periodicals. But his writings were not limited to controversial topics. He gave much attention to spiritual culture and Christian ethics, and wielded his pen with great power on such questions as slavery, education, capital punishment, and temperance. In 1841 he founded Bethany College, of which he was president from its beginning until his death, and in connection with which he made many valuable contributions to the cause of education. In 1847, during a visit to Great Britain, religious bigotry led to his imprisonment at Glasgow, Scotland, for ten days, when Lord Murray heard the case, declared the warrant illegal, and ordered the discharge of the prisoner. Subsequently, in a suit for false imprisonment, his prosecutor was condemned to pay £2000 sterling damages and fled the country. About this time Mr. Campbell became interested in the American Bible Union, a society for the promotion of faithful translations of the Scriptures, and at a later period engaged earnestly in the work as one of the revisers of the English New Testament. For a period of about forty years extensive travels in nearly all the States, in the Canadas, Great Britain, and Ireland, and constant preaching and teaching, gave Mr. Campbell large influence, and his plea for a complete return to apostolic faith and practice found many sympathizers, but also provoked much opposition. Everywhere he attracted large audiences and established a high reputation as a pulpit orator and public debater, as well as lecturer on literary, philosophical, and educational themes. He was author, in whole or in part, of sixty volumes, including the yearly issues of his periodicals, of which his own writings were the principal feature.

Mr. Campbell was tall, well-formed, and symmetrically developed in all respects. With strong domestic attachments and social affections, his home-life was charming in its simplicity, cheerfulness, and dignity. A constant stream of visitors at the Bethany mansion during a period of half a century called into play his admirable conversational powers and his cordial hospitality. His deep religiousness pervaded the home-circle and made his home a temple of prayer and praise. In all the region round about he was beloved and revered for his unspotted integrity, large benevolence, and unaffected piety. He was twice married, and the father of twelve children. He died at Bethany, W. Va., March 4, 1866. (I. E.)

CAMPBELL, Bartley, an American dramatist, was born in Allegheny City, Pa., Aug. 12, 1843, of Irish parentage. At the age of fourteen he began to write stories and verse for the periodical press. Designed by his widowed mother for the law, he began to study in an office in Pittsburg, but his taste for literature led him to become a reporter for the Pittsburg *Post*. He was afterwards editor of the *Sunday Leader* in the same city, and founded the *Evening Mail*, which he conducted for a year. He then removed to New Orleans, where he started a monthly magazine. In 1871 he wrote his first play, *Through Fire*, the success of which induced him to devote his pen to the stage. A series of successful dramas, including *Fate*, *Peril*, *The*

Virginians, was soon produced at Chicago, and some of these have been performed in Great Britain. The production of *My Partner* in New York, Sept. 16, 1879, excited great sensation and caused a great demand for his plays. He became the most popular dramatic writer of the day, and three theatres of the metropolis presented his plays at the same time. His *Galley Slave* has been produced not only in the United States, but in Australia, and has been translated into German. Besides the plays already mentioned, his most successful dramas are *Fairfax*, *My Geraldine*, *Risks*, and *The White Slave*. He is the first American that has confined his work to dramatic authorship, and his career has been remarkably fortunate. The strength of his work lies in its construction, picturesque diction, genial humor, and his thorough mastery of stage-effect.

See Vol. IV. p. 675 Am. ed. (p. 765 Edin. ed.).

CANADA. The census in Canada is taken every ten years. The method adopted is the *de-jure* system, which is followed also in the United States. This method has obvious advantages in a country like Canada, where a large percentage of the population is seafaring and apt to be absent at the date of the enumeration, and where the provincial or federal system renders the correct taking of all probable citizens as well as actual residents a matter of moment. The *de-jure* system was adopted in 1871, when the first census of the new confederation was taken; and it was continued, though not without protest, in the taking of the census of 1881, under the direction of Dr. J. C. Taché, a man of retiring habits, but of distinguished merits as a scholar and scientist. The population, by provinces, as ascertained by the census of 1881, compared with the figures of the census of 1871, was as follows:

	1871.	1881.	Increase.
P. E. Island.......	94,021	108,891	14,870
Nova Scotia.......	387,800	440,572	52,770
New Brunswick.	285,594	321,233	35,639
Quebec..............	1,191,516	1,359,027	167,511
Ontario.............	1,620,851	1,923,228	302,377
Manitoba...........	18,995	65,954	46,959
Brit. Columbia...	36,247	49,459	13,212
N. W. Territories	....	56,446	
Totals.........	3,635,024	4,324,810	633,338

Of the principal cities the population in 1881 was as follows, compared with the previous period:

Cities.	1871.	1881.	Increase.
Montreal...........	107,225	140,747	33,522
Toronto	56,092	86,415	30,323
Quebec..............	59,699	62,446	2,747
Halifax.............	29,582	36,100	6,518
Hamilton..........	26,716	35,961	9,245
Ottawa............ .	21,545	27,412	5,867
St. John.....	28,805	26,127	Decrease.
London.............	15,826	19,746	3,920
Kingston...........	12,407	14,091	1,684
Charlottetown ...	8,807	11,485	2,678

Value of Total Exports, Imports, and Goods entered for Consumption in the Dominion, with the Duty collected thereon, for Fourteen Years.

			Total exports.	Total imports.	Entered for consumption.	Duty.
Fiscal year ending	30th June,	1868......................	$57,567,888	$73,459,644	$71,985,306	$8,819,431.63
"	"	1869......................	60,474,781	70,415,165	67,402,170	8,298,909.71
"	"	1870......................	73,573,490	74,814,339	71,237,603	9,462,940.44
"	"	1871......................	74,173,618	96,092,971	86,947,482	11,843,655.75
"	"	1872......................	82,639,663	111,430,527	107,709,116	13,045,493.50
"	"	1873......................	89,789,992	128,011,281	127,514,594	13,017,730.17
"	"	1874......................	89,351,928	128,213,582	127,404,169	14,421,882.67
"	"	1875......................	77,886,979	123,070,283	119,618,657	15,361,382.12
"	"	1876......................	80,966,435	93,210,346	94,733,218	12,833,114.48
"	"	1877	75,875,393	99,327,962	96,300,483	12,548,451.09
"	"	1878......................	79,323,667	93,081,787	91,199,577	12,795,693.17
"	"	1879......................	71,491,255	81,964,427	80,341,608	12,939,540.66
"	"	1880......................	87,911,458	86,489,747	71,782,349	14,138,849.22
"	"	1881......................	98,290,823	105,330,840	91,611,604	18,500,785.97
Aggregate for fourteen years......................			$1,099,317,300	$1,364,912,901	$1,305,787,936	$178,027,860.58

The decrease in the population of St. John is correctly attributed to the great fire of 1877, which laid a large part of the city in ashes. Large numbers of people were immediately driven to the United States, where the revival of prosperity in 1878 caused their employment in permanent industries, and prevented their return.

The religious complexion of the population of the Dominion is as follows (census of 1881):

Baptists..................	296,525	Methodists...............	802,981
Roman Catholics....	1,791,982	Presbyterians...........	676,165
Church of England.	574,818	Protestants...............	6,519
Congregationalists..	26,900	Quakers....................	6,552
Disciples	20,193	Unitarians.................	2,126
Lutherans...............	416,350	Universalists............	4,517
Jews........................	2,393	Other denominations.	14,269
Episcopal Reformed.	2,596	No religion...............	2,634
Not given in returns..........................			86,769

TRADE AND COMMERCE.—Since 1866 questions of trade and commerce have been of paramount interest in Canada. In that year the Reciprocity Treaty of 1854 was terminated on notice given by the United States. The causes that led to the abrogation of the treaty by the United States have been variously stated at various times. No doubt there was a mingling of political as well as commercial motives in the minds of those responsible for the perfectly legal and regular proceeding. The Protectionists did not find the treaty profitable; the Unionists did not relish the active aid extended to the cause of the South. The treaty fell a victim to both. The immediate consequences to Canada were very striking. The channels of trade were choked up. The intimate trade-relations that had been established with the United States could not be sundered without loss to the weaker people. The agricultural products, the coal and the fish, that from Sarnia to Charlottetown had been sold in the United States, had for a time no markets at all, or such markets as were insufficient. Consequently, in 1866, 1867, and 1868 there was a good deal of commercial distress in the British provinces. In 1867 the political deadlock that existed, combined with commercial depression, made confederation imperative; and thus the severance of commercial relations with the United States may be said to have been one of the determining causes of confederation. It had other effects as well. It forced on the Canadian people the problem of protecting their own fisheries. This led in due time to the Washington Treaty and the Fishery Commission at Halifax. Great Britain recognized Canada's right to be consulted, by appointing Sir John Macdonald a commissioner. She recognized, as she had never done before, the whole case of Canada by adopting as her own all the arguments of the Canadian authorities. And the Halifax award of 1877, however objectionable it may be to the American people, remains a strong precedent in favor of the

claims of Canada to the possession of most valuable fishing-grounds. But the results of the severance of trade-relations were not yet at an end. From 1867 to 1873 the inflation of the currency in the United States enabled a 15 per cent. tariff to give efficient protection to Canadian manufactures. In 1873 the

Aggregate Trade of the Dominion on the Basis of Goods entered for Consumption, and Exports, by Countries.

Countries.	1876.	1877.	1878.	1879.	1880.	1881.
Great Britain	$83,474,320	$81,139,708	$83,372,719	$67,288,848	$80,307,286	$97,335,378
United States	75,986,909	77,087,914	73,876,637	70,904,720	62,696,857	73,570,337
France	2,394,812	1,730,062	1,754,394	2,247,066	1,928,670	2,294,043
Germany	608,355	404,918	521,580	552,909	532,028	1,019,198
Spain	445,151	340,757	325,245	394,445	297,245	446,337
Portugal	199,195	175,425	145,941	161,258	201,652	165,487
Italy	183,199	242,942	205,171	181,933	623,295	234,723
Holland	297,895	296,860	266,764	210,288	273,837	440,944
Belgium	374,880	318,724	305,692	219,461	837,897	671,267
Newfoundland	2,675,477	2,753,748	2,767,347	2,280,823	2,092,261	2,175,773
British West Indies	3,017,337	2,835,365	2,528,549	2,605,671	3,114,875	3,676,508
Spanish West Indies	1,777,269	1,847,826	1,456,985	1,813,567	3,031,050	3,067,425
French West Indies	340,153	185,234	268,424	237,129	232,857	129,360
Other West India islands	156,674	163,242	144,038	96,732	110,475	89,223
South America	975,762	656,596	669,804	745,830	1,073,421	1,369,731
China and Japan	971,314	455,755	486,244	505,513	931,457	1,430,734
Switzerland	56,168	69,066	61,178	94,781	94,225	141,789
Australia	79,693	185,610	370,723	292,613	141,782	146,506
South Africa	314,323	120,564	91,384	152,107	218,853	220,459
Other countries	1,370,467	1,165,560	904,425	847,079	953,784	1,277,205
Totals	$175,699,653	$172,175,876	$170,523,244	$151,832,863	$159,693,807	$189,902,427

Value of Goods Imported for Consumption, by Countries.

Countries.	1876.	1877.	1878.	1879.	1880.	1881.
Great Britain	$40,734,260	$39,572,239	$37,431,180	$30,993,130	$34,461,224	$43,583,808
United States	46,070,033	51,312,669	48,631,739	43,739,219	29,346,948	36,704,112
France	1,840,877	1,410,732	1,385,003	1,532,191	1,115,841	1,631,332
Germany	482,587	370,594	399,326	440,909	449,791	934,266
Spain	436,034	278,098	277,429	343,849	236,518	399,684
Portugal	71,655	45,465	41,913	25,510	35,767	56,893
Italy	40,412	29,250	53,310	33,461	459,508	88,726
Holland	267,079	202,557	213,014	200,575	171,245	225,190
Belgium	361,055	251,812	255,694	179,031	149,086	412,834
Newfoundland	774,586	641,642	672,665	639,406	581,961	652,304
British West Indies	868,846	640,716	578,405	650,967	1,208,822	1,888,695
Spanish West Indies	631,140	563,451	417,178	575,969	1,711,462	1,899,813
French West Indies	47,158	25,022	21,686	18,008	8,884	18,185
Other West India islands	68,969	13,620	16,580	8,365	15,986	8,454
South America	287,553	4,971	15,447	4,388	283,481	637,620
China and Japan	948,239	418,606	383,676	448,962	893,911	1,410,973
Switzerland	56,168	69,066	61,178	94,781	94,225	141,789
Australia	50	....	....	1,851	1,881	143
South Africa	290,359	97,394	45,019	106,592	136,675	138,815
Other countries	456,158	352,579	299,135	305,324	419,133	777,968
Totals	$94,733,218	$96,300,483	$91,199,577	$80,341,608	$71,782,349	$91,611,604

Value of Exports, by Countries.

Countries.	1876.	1877.	1878.	1879.	1880.	1881.
Great Britain	$40,723,477	$41,567,469	$45,911,539	$36,295,718	$45,846,062	$53,751,570
United States	31,933,459	25,775,245	25,244,898	27,165,501	33,349,909	36,866,225
France	553,935	319,330	369,391	714,875	812,829	662,711
Germany	125,768	34,324	122,254	112,090	82,237	84,932
Spain	9,417	62,659	47,816	50,596	60,727	46,653
Portugal	127,540	129,960	104,028	135,748	165,885	108,594
Italy	142,787	213,692	151,861	148,472	163,787	145,997
Holland	30,816	94,303	53,750	9,713	102,592	215,754
Belgium	13,825	66,912	49,998	40,430	688,811	258,433
Newfoundland	1,900,891	2,112,106	2,094,682	1,641,417	1,510,300	1,523,469
British West Indies	2,148,491	2,194,649	1,950,144	1,955,584	1,906,053	1,787,813
Spanish West Indies	1,146,129	1,284,375	1,039,807	1,237,598	1,319,588	1,167,612
French West Indies	292,995	160,212	246,738	219,121	223,973	111,175
Other West India islands	87,705	149,622	127,458	88,367	94,489	80,769
South America	688,209	651,625	654,357	741,442	789,940	732,111
China and Japan	23,075	37,149	102,568	56,551	37,546	19,761
Australia	79,643	185,610	370,723	290,762	139,901	146,363
South Africa	23,964	23,170	46,365	45,515	82,178	81,644
Other countries	914,309	812,981	605,290	541,755	531,651	499,237
Totals	$80,966,435	$75,875,393	$79,323,667	$71,491,255	$87,911,458	$98,290,823

inflation began to disappear, and the Canadian tariff began to be insufficient to save the home market from the competition of American manufacturers, who were willing to give discounts of from 10 to 25 per cent. in order to keep their market in Canada. In 1874 a change of government took place, the Liberals coming into power at the general election in that year. Almost from the time they took office the depression that existed generally fastened on Canada. The Liberal Conservatives proclaimed the gospel of protection to native industries as the one thing necessary to give aid to the manufacturing classes, and a greater command of the home market to the agricultural class as well. In 1877 and 1878, Sir John Macdonald and his friends fought out in Parliament the battle of protection. They were beaten in the House of Commons. But at the general elections in Sept., 1878, they swept the country, and came into office with a majority of 85 in a House of 206 members, pledged to the policy of protection, which thenceforth was called the "national policy."

A glance at the above tables will show the effect of the "national policy" on England, on the United States, and on Canada itself. Three things are proved beyond any question:

1st. That the Canadian national policy, instead of diminishing, has increased trade with Great Britain;

2d. That it has very materially decreased the trade with the United States, largely increasing the export, but somewhat decreasing the import;

3d. That though the times have been prosperous and the population has increased since 1874 by at least half a million, the imports in 1882 are less than in 1874 by $14,755,242; which means that goods of at least that value, formerly imported, are now manufactured at home.

INCREASE OF MANUFACTURING SINCE 1878.

The increase which has taken place in manufacturing activity in Canada since the principle of fostering home manufactures was established by Sir John Macdonald in the parliamentary session of 1879 will be evident from the subjoined statistics, supplied to Parliament by the factory commission during the session of 1882:

Number and kind of new factories started since 1878: Knitting, 7; nut and bolt, 2; knitting-needle, 1; tobacco, 2; barb wire, 1; foundries, 3; furniture, 3; woollen, 7; paper boxes, 2; boots and shoes, 3; clothing, 1; buttons, 3; organs, 3; paper-mills, 3; boilers, 1; cigar-boxes, 1; children's carriages, 1; paint, 1; salt-drying, 1; window-shades, 1; locks, 1; caps, 1; gloves, 1; mill-furnishings, 1; planing-mill, 1; lamp goods, 1; hats, 1; blankets, 3; cork, 1; envelope, 1; shirts, 2; cotton, 4; clocks, 1; metal plated ware, 2; iron bridges, 1; glass, 3; emery-wheels, 1; sugar, 5; files, 1; canning, 2; silk, 2; pianos, 4; corsets, 1; picture-frames, 4; potteries, 2; brush, 1; slippers, 1—total, 96.

The number of hands employed at these new factories is 7242, divided as follows:

Foundries, 358; furniture-factories, 78; cotton-factories, 700; organ-and-piano factories, 207; boot-and-shoe factories, 506; woollen and knitting factories, 1045; manufactures of paper, 175; mannfactures of wood, 179; mannfactures of iron, 469; tobacco-factories, 169; glass and potteries, 833; sugar-refineries, 918; articles of clothing, 612; miscellaneous, 993—total, 7242.

Percentage of Increase in the Number of Hands employed in Factories which were in existence prior to September, 1878.

In foundries the increase has been		... 14	per cent.
Furniture-factories	"	... 20	"
Boot-and-shoe "	"	... 11	"
Organ-and-piano factories	"	... 28	"
Cotton "	"	... 30	"
Woollen and knitting	"	... 19	"
Tobacco and cigar	"	... 7	"
Clothing	"	... 14	"
Glass and pottery works	"	... 25	"
Rope, flax, and brush works	"	... 11	"
Manufactures of paper	"	... 10	"
" wood	"	... 10	"
" iron	"	... 16	"
Miscellaneous manufactures	"	... 23	"

Comparison of the Prices of Manufactured Goods between Jan., 1879, and the date of our visit in 1881:

No. of factories that have made no change in price of goods			322
Factories that have increased by	25	per cent...	2
" "	20	" ...	4
" "	15	" ...	1
" "	12	" ...	1
" "	10	" ...	18
" "	7½	" ...	1
" "	5	" ...	18
Factories that have decreased by	25	" ...	3
" "	20	" ...	3
" "	15	" ...	5
" "	10	" ...	11
" "	5	" ...	25
Number from which we got no information			13

The increase in most of the factories was stated to be on account of an advance in the price of their raw material.

Comparison of the State of Wages between Jan., 1879, and the date of our visit in 1881.

No. of factories where wages have remained the same			135
Factories started since Jan., 1879, and made no change			50
Factories showing increase of	35	per cent.	3
" "	33	"	2
" "	30	"	9
" "	25	"	21
" "	20	"	42
" "	17½	"	1
" "	15	"	66
" "	12½	"	5
" "	10	"	93
" "	8	"	4
" "	5	"	31
State of wages not given			4
Factories showing decrease			none.

Number of Hands directly employed at Sugar-refining.

St. Lawrence, Montreal	320
Redpath's, "	350
Nova Scotia, Halifax	150
A. Jones's, "	33
Monckton, N. B.	60
Coaticook	200
Total	1113

Comparison of Number of Hands employed at Cotton-factories.

	1878.	1880.	1881.
Dundas	475	525	525
Canada, Cornwall	425	575	575
Merritton	70	95	95
Valleyfield	400	540	790
Lybster	180	220	220
St. John, N. B.	300	410	560
Hudon, Montreal	300	1000	1600
Brantford	.....	120	120
Coaticook	.....	225	225
Stormont, Cornwall	.....	225	675
Hamilton	.....	125	125
Kingston	.....	.....	250
Hespeler	.....	.....	250
Hamilton	.....	Estim.	300
St. Henri	.....	.....	400
Halifax	.....	.....	450
Windsor, N. S.	.....	.....	300
Monckton, N. B.	.....	.....	300
St. Stephen, N. B.	.....	.....	450
St. John, N. B.	.....	.....	400
Totals	2150	4060	8610

In all, an increase of 6460 hands in 1882 over 1878.

AGRICULTURAL PROGRESS.

In regard to the effect of the new fiscal policy on the business of agriculture the following figures, among others, were presented to Parliament in 1882 by a parliamentary committee:

Imports for Consumption of Agricultural Products.

1877-78	$21,096,628
1880-81	8,267,497
Decrease	$12,829,131

This shows a very great and favorable command of the home market given to the Canadian farmers.

Imports Re-exported.

1877-78.	$13,625,012
1880-81.	24,181,280
Increase	$10,556,268

This shows a very large increase in the export business, which those who opposed the "national policy" contended would be greatly checked by that policy.

The committee of Parliament in their report use the following language: "In reference to the effect of large exportations of farm products on the general prosperity of the farmers and people generally, we submit the following comparison of exports from the Dominion of Canada of agricultural products, including animals and their products:

1871	$22,436,071
1872	25,795,175
1873	29,238,457
1874	34,269,312
1875	29,958,865
1876	34,657,319
1877	$28,909,993
1878	32,028,611
1879	33,729,068
1880	39,901,905
1881	42,628,545

"It will be seen that in 1871, 1872, and 1873 the exports were much below the subsequent years from 1874 to 1878 inclusive, yet business was prosperous in the former period and depression existed in the latter. Since the tariff came into operation our people have not only supplied the additional home-market of $12,029,131, given by the exclusion of American farm produce, but have also exported very largely; which would lead to the conclusion that the protective tariff had stimulated the production of farm products.

"The home demand and prices obtained for meat stuffs, butter, poultry, and eggs, as well as fruit and vegetables, has been demonstrated by the evidence to be largely increased as a result of the tariff stimulating manufacturing industries and improving the condition of the mechanic and laboring-man, as well as by the exclusion of American competition in many of these articles. Fruit-growing has been especially benefited and stimulated by the operation of the tariff excluding foreign fruit which competed with Canadian-grown. A wider area of land is yearly being devoted to fruit-culture, and Canadian nurserymen find a much larger demand at profitable prices for fruit trees of every description which thrive in Canada. Indeed, from the rapidly increasing demand for fruit in Manitoba and the North-west, and from the fact that fruit trees do not thrive in that territory, it is evident that fruit-growing will become more and more an important and remunerative branch of husbandry in the older provinces."

THE FINANCES.

The financial affairs of Canada since the establishment of the Dominion in 1867 have seen three periods: 1st, a period of increasing revenue and surpluses from 1867 to 1874; 2d, a period of depression, of decreasing revenue, and of deficits from 1874 to 1878; and 3d, a period of increasing revenue and a rapid accumulation of surpluses from 1878 to 1882. The following are the official figures of the receipts and expenditures since 1867, showing the surpluses and deficits:

Expenditure as per Public Accounts.	1867-68.	1868-69.	1869-70.	1870-71.	1871-72.	1872-73.	1873-74.
Charges for management of debt, interest, and subsidies	$7,969,990	$8,403,527	$8,102,191	$8,638,565	$9,004,362	$8,717,076	$10,255,798
Ordinary expenditure	3,630,298	3,459,485	3,891,592	4,610,401	5,873,519	7,062,095	8,324,076
Charges on revenue	1,885,804	2,175,071	2,351,724	2,374,114	2,711,587	3,395,475	4,736,442
Total charged to consolidated fund	$13,486,092	$14,038,084	$14,345,509	$15,623,081	$17,589,468	$19,174,647	$23,316,316
Total receipts of revenue as per public accounts	13,687,928	14,379,174	15,512,225	19,335,560	20,714,813	20,813,469	24,205,092
Yearly surpluses	$201,836	$341,090	$1,166,716	$3,712,479	$3,125,345	$1,638,822	$888,776

Expenditure as per Public Accounts.	1874-75.	1875-76.	1876-77.	1877-78.	1878-79.	1879-80.	1880-81.
Charges for management of debt, interest, and subsidies	$11,124,726	$11,122,359	$11,489,326	$11,659,523	$11,952,641	$12,659,667	$12,525,837
Ordinary expenditure	7,868,690	8,569,774	6,835,078	6,542,510	6,941,577	6,963,852	7,293,563
Charges on revenue	4,719,654	4,796,238	5,194,896	5,301,124	5,561,162	5,227,113	5,683,153
Total charged to consolidated fund	$23,713,071	$24,488,372	$23,519,300	$23,503,158	$24,455,381	$24,850,634	$25,502,554
Total receipts of revenue as per public accounts	24,648,715	22,587,587	22,059,274	22,375,011	22,517,382	23,307,406	29,635,297
Yearly surpluses	$935,644	....	....	....	....	....	$4,132,743
" deficits	....	$1,900,785	$1,460,026	$1,128,147	$1,937,999	$1,543,228	

The amount of expenditure on national works and for national purposes since 1867 is as follows:

Miscellaneous public works	$25,731,684
Pacific Railway	21,457,263
Intercolonial Railway	25,878,448
Works in North-west Territory and Dominion lands	3,254,681
Total debts allowed provinces	20,452,340
Total capital expenditure since confederation	$96,774,416
Net increase of debt since confederation	79,667,139

The revenue has shown itself so progressive that the finance minister, Sir Leonard Tilley, has calculated that by the close of 1884 he will have accumulated such a succession of surpluses, and will have so reduced the public debt, that he will be in a position to pay the subsidy of the Pacific Railway syndicate, $25,000,000, without having added to the *per capita* taxation of the people. During the session of 1881 taxes to the extent of $1,250,000 were repealed, tea and coffee (except when imported from the United States, when a duty of 10 per cent. is exacted to encourage direct trade with the places of growth) being made free, the stamp-duties being taken off, the postage on newspapers removed, and a variety of articles added to the free list. And in the session of 1882 a further sum of about $1,250,000 was taken from the taxation, thus making a reduction in taxation of about $2,500,000 in two years.

THE PACIFIC RAILWAY.

The greatest public work ever undertaken by so young and so comparatively poor a country as Canada is the Canadian Pacific Railway, which begins east at Callender Station, at the end of Lake Nipissing, and ends at Port Moody on the Pacific coast. It was first made a public work by the terms on which British Columbia entered the Confederation in 1871. In 1873 an attempt was made by the Government of Sir John Macdonald, by means of a company, to begin the work on a subsidy of $30,000,000 and 50,000,000 acres of land. Partly owing to the defeat of the Government, and partly to the failure of the company to float their scheme in the London market, this plan fell through. The next Government, of Hon. Alexander Mackenzie, entered on the construction of the railway as a Government or public work. The first expenditure on construction, as stated in the reports of Mr. Sandford Fleming, was made in 1874, when contracts for a telegraphic line to precede the railway were let. In the same year contracts for the Pembina section, for 63 miles north of the international boundary-line, were given out. By 1878 this line was extended to Selkirk, a distance of 85 miles, and in 1881 it became a part of the subsidy to the syndicate which undertook the construction of the whole road. In 1874 also a subsidy was granted for the construction of the Canada Central line to the eastern terminus, near Lake Nipissing. In 1875 two sections of the line between Thunder Bay and Winnipeg were placed under contract. In 1878 a branch line was undertaken to the Georgian Bay, but this was abandoned. In 1879 the remaining sections of the line between Thunder Bay and Red River were contracted for. In the same year a section 100 miles west of Red River was let. In 1880 a section of 120 miles was let in the mountain-region, from Yale to Kamloops. In 1881 the Government entered into a contract with a private company for the construction of the remaining sections and the operation of the whole line at its own cost. The subsidy of the company is $25,000,000 and 25,000,000 acres of land, valued at $1 per acre, and the whole line, when completed, is to go to the company, making the subsidy and total cost of the road $78,000,000, or thereabouts. The work of construction has gone on with rapidity. The line from Thunder Bay to Red River and 200 miles beyond is now open for traffic. The section in British Columbia to the terminus on the Pacific is under contract, and the company has promised to finish the section north of Lake Superior in five years, or in 1886, or five years earlier than their contract requires. When this great work is completed, and supplemented by a line connecting with American roads at the Sault Ste. Marie, it is hoped in Canada that a new and splendid era of national prosperity will open.

Railway Statistics.

The spread of railway-lines in Canada has been steady. The building of the Intercolonial Railway, connecting Halifax with Quebec, was one of the best results of confederation; and since that line was completed there has been a more rapid growth in railway enterprise. The mileage on the 30th of June, 1880, was—

Railways in operation	6891·18
" under construction and having track laid.	338·65
" under construction	1077·66
	8307·66
Private capital invested	$284,419,293
Government subsidies (including provincial and municipal grants)	104,866,406
	$389,285,699

Number of Passengers carried on Principal Lines.

Name of railway.	1880–81.	1879–80.	Increase.	Decrease.
Grand Trunk and leased lines	2,179,793	1,995,526	184,267	
Great Western and leased lines	1,838,788	1,764,519	74,269	
Intercolonial	631,245	581,483	49,762	
Canada Southern	260,990	*278,818	....	17,828
Northern and North-western	411,847	386,169	25,678	
Midland	116,554	116,857	....	303
Toronto, Grey, and Bruce	111,076	121,685	....	10,609
Toronto and Nipissing	87,058	89,933	....	2,875

* 1878–79.

The freight carried on the same lines during the two years compares thus, in tons:

Name of railway.	1880–81.	1879–80.	Increase.
Grand Trunk and leased lines	3,295,288	2,835,561	459,727
Great Western " "	2,572,052	2,216,382	355,670
Intercolonial	725,577	561,924	163,653
Canada Southern	2,135,811	1,836,948	298,863
Northern and North-western	562,309	489,600	72,709
Midland	202,095	137,515	64,580
Toronto, Grey, and Bruce	116,487	115,257	1,230
Toronto and Nipissing	120,573	105,473	15,100

The earnings of the railways compare as follows:

	1880–81.	1879–80.	Increase.
Passengers	$8,223,254	$7,076,340	$1,146,914
Freight	18,666,982	15,506,935	3,160,047
Mails and express	946,159	851,288	94,871
Other sources	145,332	102,076	43,256
Total	$27,987,509	$23,536,639	$4,450,770

The earnings per mile of railway under traffic were therefore—

	1880–81.	1879–80.
Passenger traffic	$1135	$1024
Freight "	2574	2243
Mails and express	130	123
Other sources	20	15
Total	$3859	$3405

Canada's Relation to England.

Within the past decade—since, in fact, the establishment of the Dominion—a very marked change has come over the relations that existed between Canada and Great Britain. This change has not come about insensibly or as a matter of development; it has proceeded by regular steps from point to point, each party recognizing the change as it proceeded, and giving official sanction to it. In 1869, in consequence of discontent with the financial terms on which Nova Scotia had been pledged to the union by the local government previous to the formation of the Dominion, the local government which came into office after the union appealed to England for repeal of the union. But the British Government refused to entertain the petition, and referred the question to the new government of the Dominion. England wished to get rid of these provincial questions. In 1871, when the fishery-question discussion precipitated the Washington convention and widened the field of discussion for that body, Sir John Macdonald was appointed as an imperial commissioner, and was recognized as probably the ablest man engaged on the British side in that too-famous negotiation. In 1876, it having been discovered that the governor-general, appointed by England and having large powers of action, might exercise the prerogative of mercy independent of the judgment of his responsible advisers, the British Government consented at once to change the royal instructions in that respect; and this was accordingly done. In 1877, when the fishery commission was to sit at Halifax, Sir Alexander Galt, a Canadian, was appointed the British commissioner. In 1879, the Dominion Government having removed the lieutenant-governor of Quebec for improper and unconstitutional conduct in dismissing for political purposes his ministers, who had a parliamentary majority, and the governor-general himself having disapproved of the act of his ministers, the British Government reproved the marquis of Lorne for not having taken the advice of his ministers. In 1880, Sir Alexander Galt was, at the request of the Canadian Government, admitted as a diplomatic representative in London; and the colonial secretary in a public speech pledged the Government of the empire not to engage in foreign negotiations without considering the interests of Canada. Thus, step by step, each well defined and well considered, the position of Canada in the empire was made more marked, more independent, and more dignified. But when, in the session of 1881, the leader of the opposition attempted to go further and asked the House of Commons of Canada to declare for the right to negotiate treaties independent of England, the loyalty of the House and of the people took fire, and the proposition, in view of the position already held by Canada, was rejected with indignation, though it is still entertained by a small portion of the press of the Dominion. In the session of 1882 papers were brought down to Parliament, from which it appeared that the imperial authorities had recognized the right of Canada to impose differential duties; and in a speech delivered to the two houses of Parliament on May 25, 1882, the marquis of Lorne, governor-general, used this remarkable language: "You have the power to make treaties on your own responsibility with foreign nations, and your high commissioner is associated, for purposes of negotiation, with the Foreign Office. You are not the subjects but the free allies of a great country, which gave you birth and is ready with all its energy to be the champion of your interests. Standing side by side, Canada and Great Britain work together for the commercial advancement of each other."

The gradual growth of independence in the matter of local self-government has been especially marked in the matter of fiscal policy. "In 1859," says Mr. Todd in his valuable work on parliamentary government in the colonies, "upon the enactment of a new Canadian tariff, certain manufacturers of Sheffield moved the colonial secretary, the duke of Newcastle, to protest against it. Whereupon His Grace wrote a despatch to the governor-general, dated Aug. 13, 1859, upon the subject. In reply, Mr. (now Sir Alexander) Galt, the Canadian finance minister, wrote a memorandum which was transmitted to the Colonial Office by the governor-general, wherein he asserted it to be his duty 'distinctly to affirm the right of the Canadian legislature to adjust the taxation of the people in the way they deemed best, even if it should unfortunately happen to meet the disapproval of the imperial ministry. Her Majesty cannot be advised to disallow such acts unless her advisers are prepared to assume the administration of the affairs of the colony irrespective of the views of its inhabitants.' 'This position,' he added, 'must be maintained by every Canadian administration.' The imperial Government did not attempt to question the soundness of this position, and they have ever since evinced a disposition to acquiesce in the exercise by the Canadian Parliament of the utmost freedom in the determination of their commercial policy, without regard to its application to, or agreement with, the ideas embodied in the legislation of the mother-country or advocated by the ministers of the Crown in Great Britain. In 1867, by the British North America Act, the act of union of the colonies, the exclusive authority of the Dominion to regulate matters of trade and commerce was recognized. In 1879, on the passing of the new protective policy in Canada, certain of the manufacturers of the great manufacturing towns again made protest in England, but the colonial secretary was not in a position to do other than declare the perfect freedom of Canada to regulate her own affairs; and the governor-general of Canada forwarded a memorandum showing that the trade of the Dominion was in fact more likely to be increased than diminished with England by the new fiscal system. The right of appointing the governor-general of the Dominion, the right of disallowing acts not affecting trade and commerce within two years, and the right of making treaties affecting the Dominion as a portion of the empire,—are the only claims to supremacy now asserted by Great Britain. The first of these will long stand, as it is an obvious advantage to the Dominion to have a governor-general of such rank and ability as can be provided from among the body of British peers and diplomats, and free from any bias towards either of the political parties. The second right has only been exercised once since the formation of the Dominion. And the third has been minimized by a repeated public pledge that the rights of Canada shall be considered and her interests protected in the negotiation of all treaties likely to affect them in any way."

By an order in council the North-west Territories of Canada in 1882 were divided into four new territories: (1) Assiniboia (area, 95,000 square miles), bounded S. by the United States, E. by Manitoba, N. by a line near the 52d degree of N. latitude, and W. by a line between the 110° and 111° W. longitude; (2) Saskatchewan (114,000 square miles), lying N. of Assiniboia and W. of Lake Winnipeg and the river Nelson (or Lower Saskatchewan); (3) Alberta (100,000 square miles), lying between Assiniboia on the E. and British Columbia on the W., having the United States on the S., and on the N. the territory called (4) Athabasca (122,000 square miles), which includes the Peace River Valley and its vicinity. (M. J. G.)

CANAJOHARIE, a village of Montgomery co., N. Y., is on the S. bank of the Mohawk River, on the New York, West Shore, and Buffalo Railroad, 55 miles W. of Albany. The New York Central Railroad passes along the N. bank of the river, and has here a station called Palatine Bridge. The town has three hotels, two banks, three weekly newspapers, machine-shops, planing-mills, flour-mills, a brewery, and manufactures of sacks, shirts, gloves, washboards, trunks, pulley-blocks, and carriages. It was originally called Roof Village. About 9 miles S. is the famous watering-place, Sharon Springs. Population, 2013.

CANAL DOVER, an incorporated village of Tuscarawas co., Ohio, is on the Tuscarawas River and the Ohio Canal, 100 miles N. of Marietta. It is on four railroads—the Cleveland and Marietta, the Cleveland, Tuscarawas Valley, and Wheeling, the Wheeling and Lake Erie, and a branch of the Cleveland and Pittsburg Railroad. It has three hotels, two banks, two weekly newspapers, two schools, seven churches, and a children's home. Its industrial works are a blast-furnace, two foundries, two salt-works, two fire-brick works, a rolling-mill, flour-mill, furniture-factories, three carriage-factories, and a planing-mill. It was settled in 1825, and incorporated in 1865. The surrounding country contains coal and iron. Population, 2208.

CANBY, EDWARD RICHARD SPRIGG, LL.D. (1817–1873), an American general, was born in Kentucky in 1817. He graduated at West Point in 1839, served in the Florida War, and in 1842 had charge of the removal of Indians from Georgia to Arkansas. He served in the Mexican War under Gen. Scott, and was twice brevetted for gallantry. He attained the rank of captain in 1851, major in 1855, and colonel in 1855. At the outbreak of the Civil War he was stationed at Fort Craig in New Mexico, and when his superior officers had resigned to join the Confederacy he displayed great skill and energy in defending the fort against the Texan troops. He fought the battles of Valverde and Peralta, and was made brigadier-general of volunteers March 31, 1862. He was then employed on special duty in the War Department at Washington, and in July, 1863, was placed in command at New York to suppress the riots caused by the draft. In May, 1864, he was promoted to be major-general of volunteers, and succeeded Gen. N. P. Banks in command of the armies west of the Mississippi River. In 1865 he conducted the operations against Mobile, capturing that city April 12, and received the surrender of the Confederate generals Richard Taylor and E. K. Smith. After the close of the war he had command of various departments in the Southern States, and was appointed brigadier-general in the regular army July 28, 1866. He was often chosen for important and difficult positions, and in 1869, though fatigued by laborious duties, he consented to take command of the Department of Columbia on the Pacific coast. In the winter of 1872–73 the Modoc Indians, occupying the "lava beds" in the northern part of California, gave trouble. Gen. Canby proceeded to the place, and while holding a parley with them was treacherously shot by a chief called Captain Jack, April 11, 1873.

See Vol. IV. p. 711 Am. ed. (p. 805 Edin. ed.).

CANE. This plant gives the name to the well-known canebrakes in the southern portion of the Atlantic section of the United States. It is the largest grass of the United States, and not very distantly related to the celebrated bamboo of the Asiatic lands. These canes constitute the genus *Arundinaria*, which, with *Bambusa* (the bamboo) and about ten other less-known genera, form the *Bambusidæ*, or bamboo section of the great family of Grasses. The species which forms the Southern canebrakes is *Arundinaria macrosperma* of Michaux, though, for some unexplained reason, renamed *A. gigantea* by Chapman. It grows from 10 to 20 feet high, though Dr. Darlington reports in his *Agricultural Botany* that it sometimes grows "30 feet or more," when it makes admirable poles for the disciples of Izaak Walton. A smaller species, *Arundinaria tecta*, growing from 2 to 10 feet, is critically distinguished as the "reed," but in popular works "Cane" is often used indifferently for either species, which, after all, may be but forms of one. Unlike grasses generally, which put up culms that flower and die the same year, the Cane sends up a single straight stalk the first year, and the next branches out from the nodes. The year following it may flower, but perhaps not for several years; but after it flowers it dies back to the ground, and then pushes up a new growth from its creeping root-stocks. Cattle are extremely fond of it, and thrive on it to a wonderful extent where it abounds; and it is not unusual to find it put forth as among the great advantages of farm-lands when offered for sale that there is abundance of Cane on which cattle at large may feed all winter long. In some parts of Georgia an South Carolina, however, where Cane once abounded, it has almost wholly disappeared from the continual browsing of cattle, which prevents so strong a growing plant from strengthening its roots by exposure of mature leaves to the atmosphere. Still, in wet places, where cattle have not free access, there are yet enormous quantities, and mills prepare it for paper-stock. The smaller species, *A. tecta*, is very useful in affording its split stems for making chair-bottoms, baskets, and similar work, while the leaves are said to impart a fine green color to wool.

A number of species are found in warmer parts of the world. Some of them, as in the East Indies, are used for thatching roofs, as the large amount of silex the culms contain prevents rapid decay. One species, *Arundinaria Schomburgkii*, furnishes, in the hollow stems taken between the nodes, the Indians of Guiana with the blowguns from which they expel the arrows which have had their heads dipped in the fatal *urari*.

The two species of the United States are not often found north of the Potomac. Dr. Cooper, in his *Essay on the Forests of the United States*, reports the larger species as growing "in Delaware and the lower counties of Maryland." The smaller form the writer has gathered in Illinois. (T. M.)

CANNELTON, an incorporated village and the county-seat of Perry co., Ind., on the Ohio River, 70 miles above Evansville. It has eight churches, seven hotels, two weekly newspapers, a graded school, gasworks, a large cotton-mill, a public park, and manufactures of chairs, paper, brooms, flour, stone-ware, sewer-pipe, iron castings, etc. The Indiana cotton-mill of this place is a sandstone structure 300 feet long and five stories high. In the vicinity are immense beds of cannel coal, extensively used in steamboats. Cannelton was settled in 1849. Population, 1834.

See Vol. V. p. 3 Am. ed. (p. 1 Edin. ed.).

CANON OF SCRIPTURE. The article in the ENCYCLOPÆDIA BRITANNICA teaches that the Canon of the Scriptures was determined by selecting certain books, long after they were written, from a certain mass of existing literature, and conuting them as thenceforth a class by themselves; that the New Testament was thus selected mainly "by a few leading Fathers towards the close of the second century;" that the Law, the Prophets, and the Hagiographa are three successive instalments of the Old-Testament Canon; that the third of these lesser canons was made "about a century or more anterior to the Christian era," and finally settled at the Council of Jamnia, about 90 A. D.

The truth of these teachings depends largely upon definition. The term *Scripture* denotes a certain well-known collection of writings which are, in a peculiar sense, the sacred writings of the Israelitish and Christian religions. To indicate that a writing is entitled to belong to this collection we may say that it possesses *scriptural character*. We may thus employ these simply as convenient descriptive terms, irrespective of their relation to divine inspiration or kindred matters. Now, by the statement that the canonical Scriptures were selected from a larger body of literature one might possibly mean that they received their scriptural character from the alleged selection—that they became Scripture by being so selected; or he might mean that the selection was the authoritative human recognition of the scriptural character which, in their own right, they already possessed; or he might count the so-called selection to be simply an historical inquiry and decision in regard to the scriptural character which they had previously possessed and been recognized as possessing. In other words, canonicity may be either (1) scriptural character, or (2) recognized scriptural character, or (3) historical decision in regard to recognized scriptural character.

The article to which we refer certainly does not claim that the Scriptures derive their scriptural character from the men who collected them. It takes the distinctively Protestant and evangelical position that "the canonical authority of Scripture does not depend on the Church or its councils. The primitive Church may be cited as a witness for it; that is all. Canonical authority lies in the Scripture itself; it is inherent in the books so far as they contain a revelation or declaration of the divine will." But its statements beyond this point, like those of much of the recent literature on the subject, are very uncertain. While they are true only under the third definition, they yet employ the terminology which more naturally connects itself with the first or second. This will be made clear if, using the language just quoted, we ask, What is it for which "the primitive Church may be cited as a witness"? According to the hierarchical view, it is for the fact that the Church, being divinely authorized to do so, assigned to the books their scriptural character, so that the authority of the Bible depends upon that of the Church. According to another familiar view, the witness is to the fact that the books were received as scriptural from the times when they were published, and hence that the same influences which gave them their scriptural character caused them to be recognized and received in that character. But in the article in the ENCYCLOPÆDIA BRITANNICA the witness is represented as being to the still different fact that certain men, acknowledged to be both uninspired and incompetent, seeing the need of "a code of apostolic writings, divine and perfect like the Old Testament," selected such a code from the Christian writings with which they were familiar—just as other men had previously selected the Old Testament itself from the national literature of Israel.

This third view is entirely consistent with the second if we may understand by it merely that these men set apart the books which, from the time of their publication, had been received as scriptural, so as to secure for them a more distinct and uniform recognition. And it is only in this sense that we can acknowledge it to be true. The so-called framers of the Canon framed it merely in the sense of pronouncing an historical verdict, based upon investigation, as to what books had from the first been accounted scriptural. If canonicity be deemed identical with scriptural character, then the Canon was complete to date as fast as the books were written, and was finally completed at the same moment with the latest book. It follows from this that it was complete much earlier than the dates above assigned, and that the three divisions of the Old Testament are not three successive instalments of the Canon, but are merely a classification of it.

This difference of view has already been stated in the article BIBLE in this work. We here present some further considerations on the same side of the question.

1. *The habitual claim* of the men and the councils that are said to have formed the Canon is that their work was a process of historical inquiry. They uniformly ask, not whether a book shall now be admitted into the Scriptures, but whether it has hitherto been regarded as scriptural. In the case of the New Testament no one disputes that "apostolic origin was the chief" among the grounds for their affirming the canonical authority of a writing. It is also correct to assert that the prominent reason for engaging in this work was "the necessity of meeting heretics with their own weapons, in their own way, with *apostolic records* instead of oral tradition." In the nature of the case it would not have answered their purpose to say, Here is a writing which we will henceforth receive as apostolic or as otherwise of divine authority. They must needs say, This is one of the writings which has always been received as apostolic or as otherwise divine. As a matter of fact, this is what they actually said in such cases, as will be admitted even by the men who dispute the truth of the claim they thus made. The same holds in the case of the Old Testament. For example, the famous verdict of Akiba in the Council of Jamnia was, "No one in Israel has ever doubted that the Song of Solomon is canonical" (*Iadayim*, iii. 5).

2. *The evidence commonly alleged against this claim is inadequate.* Of course there is no absurdity in supposing that the claim may be fraudulent, or a merely conventional way of describing an innovation as if it were a fact of history; but that it is so no one has a right to assert until he can prove it. But in proof, curiously enough, not a particle of direct evidence seems to be alleged. The claims of the books were publicly discussed throughout the whole of the Canon-making period. The case against some of them was fully argued on the ground that their claims were mistaken. But have we any account that any such claim was disputed in those days on the ground of its not being made in good faith? Did any opponent ever reply, His assertion that the book was received in the past is only a fictitious way of asserting that he thinks it ought to be received in the future? If this sort of fiction was then being habitually practised, somebody must have known it, somebody must have tried to expose it. Some trace of the exposure must have been handed down in the voluminous controversial literature which has come down to us. This is a case in which the argument from silence is clearly of great weight. Unless there is some direct proof that these claims were fraudulently or conventionally made, we must hold that they were made in good faith, and are to be understood in their natural meaning. Will any one venture to say that there is any such proof? The fact that the claims were disputed seems to be principally relied upon for showing that they were either fictitiously made or else mistaken. But a glance at the article under consideration will show that they were disputed, not merely up to the close of the second century A. D., but in the third century and the fourth, and in every century since. The disputes, too, have been largely over the same books and with the same arguments. If this fact proves that the books have not been received from prophetic and apostolic times, then it proves that they were not received in the second century, and have never been received.

Certain particular facts are adduced. For example, it is said concerning the New Testament: "The collection of writings was not called *Scripture*, or put on a par with the Old Testament as sacred and inspired, till the time of Theophilus of Antioch (about 180 A. D.)." But no proof of this would be alleged except from silence; and the silence, in this case, is not at all decisive, since it is that of a small body of literature which had no particular reason for mentioning the matter. For anything we know, the collective New-Testament writings may have been habitually called *Scripture* long before the date mentioned, even if they do not happen to be called so in the extant literature of that period. But the silence itself is by no means unbroken. It is true that the apostolic Fathers often cite the facts mentioned in the New Testament rather than the books, and that they may have obtained the facts from tradition. But it is also true that Clemens Romanus, Ignatius, and Polycarp mention the Epistles to the *Corinthians*, the *Ephesians*, and the *Philippians*; that Papias mentions the Gospels of *Matthew* and *Mark*, and is familiar with that of *Luke;* and that from the middle of the second century we find frequent mention of the different books and of collections of them. It is also true that the New Testament was written by men who were familiar with the Old Testament and with the scriptural character which it possessed, and that these men claim religious authority for their own writings, (*e. g.*, John xx. 31; 2 Thess. ii. 15; iii. 14). And, apart from all particular claims, the whole structure of these writings is that of authoritative utterance. Apparently for this reason pains are taken in authenticating them (2 Thess. iii. 17). They are to be read and circulated, to all appearance, in the public religious assemblies like the Old-Testament books (Col. iv. 16; 1 Thess. v. 27). In 2 Pet. iii. 16 the Epistles of Paul at least are certainly put on a par with "the other Scriptures." And when we have thus established the fact that the apostles professedly taught Christianity by means of Scriptures of their own writing, we can hardly avoid the conclusion that the foundation of the apostles and prophets (Eph. ii. 20; 2 Pet. iii. 2) is one which includes the apostolic and prophetic Scriptures.

The assertion is made that "The individual who first gave public sanction to a portion of the national Jewish literature was Ezra, who laid the foundation of a canon. . . . The public authority he conferred on the Law is the first step in the formation of the Canon." But, waiving all questions as to what Ezra had to do with the origin of the Pentateuch, and therefore all questions as to the extent of the Law previous to his time, the evidence at least shows that the Law was in existence in writing, was used for purposes of authoritative appeal, and was, at least to some extent, identical in its contents with the older parts of our present Scriptures. If, therefore, the conferring of public authority on the Law is the first step in the formation of the Canon, then this step had been taken centuries before the time of Ezra. Indeed, by this definition the book of Ezra ascribes to him no canon-making whatever, for it speaks of him as the scribe of the Law, and not as its author. Its origin is indicated when it is called sometimes the Law of Moses and sometimes the Law of the God of the heavens. If the conferring of public authority upon writings which claim to be the divine law is the beginning of the Canon, then the Scriptures themselves claim that the Canon began at least as early as Moses, and reached its final dimensions by a process of growth which extended through the centuries.

3. *If the work of collecting the canons was one of simple historical inquiry, its results are thereby accounted for.* On any theory, the Canon of the Old Testament did not include all the Israelitish literature, nor that of the New all the Christian literature, extant in those times. On the theory of a comparatively recent selection, "if it be asked on what principle books were admitted, it is not easy to answer." This conceded difficulty in answering grows as one studies the subject, and constitutes a grave objection to the theory in which it inheres. But on the hypothesis that the collectors

did simply what they professed to do, the difficulty has no existence. To use the terms of the evangelical theology, the same inspiration which produced the writings accredited them to the generation among whom they were produced, so that afterward the question what writings had been received as thus accredited was merely a question of historical evidence. Or, leaving out the theological terminology, the same influences which gave the writings their peculiar character caused each of them to be recognized in that character from the time when it first became known.

4. *Many important phenomena*, inexplicable on the other theory, confirm the view now advocated. Of Josephus, for example, we are told that "we learn nothing from him of its history, which is somewhat remarkable, considering that he did not live two centuries after the last work had been added. The account of the Canon's final arrangement was unknown to him." If we state the facts more precisely, the case becomes still more remarkable. Josephus was a man in the prime of life when the Council of Jamnia was held. If his acquaintances were busy in making up a third Canon by setting apart our present Hagiographa from the profane company they had hitherto kept, or in revising such a Canon which some one had previously made, Josephus must have known it. But he betrays no consciousness of any such knowledge. The supposition that he had such knowledge is inconsistent both with the plain statements he makes and with his whole use of the sacred writings. In a celebrated passage (*Cont. Ap.*, 1–8) and elsewhere he affirms that all the Old-Testament books had then been recognized as having a peculiar sacred character for about five hundred years. The threefold division which he gives is so far from showing that the Hagiographa is a third Canon that it seems to prove that our *present* division of Prophets and Hagiographa had not then been made.

The theory of an Alexandrian Canon of the Old Testament, different from that which prevailed in Palestine, belongs with that of a Canon selected at a late date and fictitiously maintained. On the other theory, the Old-Testament Apocrypha are *midr'shim*, and not Scripture.

To mention but one more particular: the theory of a difference in sanctity between the different parts of the Old Testament is closely connected with the selection-theory of the Canon. But there is no trace of any such difference in the New Testament or its contemporaneous literature, and very little trace of it even for some time after. On the other hand, the sanctity of many of the Psalms, of Job, and of other parts of the Hagiographa is historically known to have been recognized long before the time of Ezra or the writing of many of the prophetic books. So far as we have evidence, the phenomena are just the reverse of what we should expect if the books were brought together by a late selection and recognized as sacred by reason of their having first been recognized as canonical.

Among recent noteworthy works on the Canon are Samuel Davidson's *Canon of the Bible* (London, 1878; 3d ed. 1880); the articles on the "Canon," by H. L. Strack and Woldemar Schmidt, in the *Schaff-Herzog Encyclopædia of Religious Knowledge*; Edward C. Mitchell, *The Authenticity, Canon, and Text of the Greek New Testament* (Andover, 1880); A. H. Charteris, *Canonicity* (1881); J. J. Given, *The Truth of Scripture in Connection with Revelation, Inspiration, and the Canon* (Edinburgh, 1881). (W. J. B.)

CANON, in Music. The harmonic canon of the mathematicians was commonly referred to in ancient times to prove the consonance or dissonance of notes differing only in pitch. Those musicians who thus appealed to the canon, or rule, were called *Canonici*. The terms "Canon of Pythagoras," "Canon of Euclid," etc., refer to the particular modes of dividing monochord employed by these philosophers. Musicians who followed Aristotle and Aristoxenus (who made the ear the sole judge of consonance and dissonance, and their own usages their laws) were called *Musici*. Similar opposing parties also existed in the various Oriental nations, and are found now among ourselves. Hence the idea of the "music of the spheres," and Aristotle's glimmering notion of a keynote as a kind of central sun, in that it is of superior importance, and many similar singular fancies. The science involved in the various theories for the calculation of intervals by dividing a monochord was called *Canonike*. The "section of the canon" of Ptolemy determines the divisions of the octave that constitute our modern major scale. Modern musicians generally employ logarithms in calculating very small intervals or slight variations in larger intervals.

Musical canons are compositions constructed with rigid conformity to law or rule as regards form. A round or catch best illustrates the essential principles of the canonic form, although canons are generally much more extended and highly developed, and require greater mental powers for their projection. The well-known round "Three Blind Mice," in which the three singers respond to each other by repeating the same notes a few moments later, may be called an extremely simple form of a canon, three in one, in the unison. If the composer had employed eight voices instead of three, it would be called eight in one. When, instead of singing exactly the same notes, the singers repeat the same melody at another pitch, the canon is said to be in the fourth or fifth, or whatever interval happened to be chosen, instead of "in the unison." When there are two melodies and four singers, the canon may be a duet-canon or a duet of canons, and at any intervals. Canons vary, therefore, in the number of voices and melodies heard simultaneously, and in the pitch of the responding voices.

In some canons the melodies are very slightly modified as regards intervals; in others the melodies or their repetition are sung quicker and slower (*by augmentation* or *diminution*), or are inverted; *i. e.*, the responding voices measure the required intervals downward instead of upward, or the reverse. In a canon by retrogression the responding parts repeat the notes of the melody backward.

There are many forms of canons in general use, but these are the most commonly found. Canons form a highly valuable mental gymnasium for the exercise of musical students. For several centuries English composers prided themselves greatly in being masters of this style of construction. The earliest specimen of part-writing extant is in canonic form. Possibly on account of the difficulty of finding copyists, in olden times composers planned canons in such a manner that the music was written out for one part only, signs being placed at the points where the answering voices entered. These were called "enigmatical canons," for sometimes the points were misplaced or omitted altogether. Modern musicians have put forth highly interesting canons in many different varieties, often showing marvellous artistic skill. Sometimes accompanimental parts that are less strict in structure are added to enhance the general effect. "Non Nobis Domine," by Byrde (1538–1623), which is commonly sung as "Grace before and after meat" by bodies of learned men in England when they dine together, is in the form of a canon, three in one, in the fifth octave below. (S. A. P.)

CAÑON CITY, the county-seat of Fremont co., Col., is on the N. bank of the Arkansas River, a few miles below the Grand Cañon of the Arkansas, and on the Denver and Rio Grande Narrow-gauge Railroad, 45 miles W. N. W. of Pueblo. It has a bank, a weekly newspaper, good hotels, seven churches, good schools, a military college, and the State penitentiary. It is a resort for invalids, having soda springs, hot and cold; has abundant water-power, and is surrounded by mines of gold, silver, copper, lead, and mica, as well as stone-quarries and lime-kilns. Petroleum and lignite are also found here. Population, 1501.

CAÑON WREN, an oscine passerine bird of the genus *Catherpes* and family *Troglodytidæ;* there is but one species, *C. mexicanus*, with two varieties, *C. m. conspersus* and *C. m. punctulatus*, inhabiting the Southwestern United States and southward. The bill is remarkably slender, with a peculiar axis, nearly in line with that of the frontal region of the skull; the tarsus shows a tendency to subdivision of the lateral plates, a character very exceptional in *Oscines*. The cañon wren is 5 or 6 inches long; the wing, $2\frac{1}{10}$ to $2\frac{8}{10}$; the bill, $\frac{3}{4}$ to 1; the upper parts are brown, paler and grayer before, rich and rufous behind, everywhere dotted with whitish and with dusky specks; the fore underparts are pure white, shading behind through tawny brown into rich mahogany-color; the tail cinnamon-brown, fully black-barred. The varieties mentioned only differ a little in size and tint. They inhabit rocky and precipitous places, and are famous for the volume of their rich ringing notes; the eggs are laid in a nest in a rift of the rocks or other nook, to the number of five or more, and are crystal-white, sprinkled and blotched with reddish-brown. (E. C.)

CANOSSA, a village of Northern Italy, in the province of Modena, 11 miles south of Reggio. On the adjoining mountain are the ruins of a castle destroyed by the people of Reggio in 1255. It was the scene of one of the most memorable events of mediæval history. Here Henry IV., emperor of Germany, humbled himself before Gregory VII. The reforms which this pope had instituted in the Church were a direct blow at Henry, under whom simony had flourished, but the emperor did not openly resist until he himself was cited to appear for trial at Rome. A diet was then held at Worms (Feb. 22, 1076), at which Gregory was declared to be deposed on the ground of tyranny and various crimes. As soon as he was notified of this action, Gregory replied by excommunicating all the bishops who had attended the diet and solemnly excommunicating and deposing the emperor. His subjects were absolved from their allegiance, and steps were taken to confer the imperial dignity on Rudolf of Suabia. Henry, forsaken by his recent supporters, was obliged to submit. In the depth of winter he hastened across the Alps and climbed the ridge to the castle of Canossa, then belonging to Matilda of Tuscany, where the pope had sought refuge while still uncertain of the emperor's object in coming to Italy. For three days (Jan. 25–27, 1077) the once haughty emperor was obliged to wait in the outer court. Clothed in a penitent's coarse shirt, with bare head and feet, he begged to be admitted to the pope's presence that the dreadful sentence of excommunication might be removed. At length he was received and restored to the Church, with the express condition that he should not resume the imperial dignity until the case had been still further examined. The triumph of the pope was complete; he had not only freed the papacy from the patronage of the emperor, but he had reversed their former condition, and shown to the world an example of the submission of the highest temporal sovereign to the exactions of the ecclesiastical power; and, though his victory in this particular case was not lasting, though Henry again dared to resist, and even drove the pope to die in exile, the scene at Canossa remained typical of the victory of the Roman Church in its struggle with the sovereigns of Europe. It was forcibly recalled by Prince Bismarck during his contest with the ecclesiastical authorities and their supporters when Pope Pius IX. declined to receive Cardinal Hohenlohe as the German ambassador at the Vatican. In the debate which followed in the German Parliament (May 14, 1872) the imperial chancellor, turning suddenly to the Ultramontane members, exclaimed, "Of this you may be sure: we are not going to Canossa;" and the words became in a few days a popular cry.

CANOVAS DEL CASTILLO, Antonio, a Spanish statesman, was born at Malaga in 1830. He received his education at Madrid, where he took courses in philosophy and jurisprudence, and entered upon a literary career. In 1852 he was elected to the Cortes by the city of Malaga; in the same year he performed the functions of minister of the interior, and two years later was made chargé d'affaires at Rome. During this period he aided in preparing the concordat between Spain and the Holy See. In 1861 he was appointed under-secretary of state, and in 1864 received the portfolio of minister of the interior as a member of the Mon cabinet. In the subsequent O'Donnell cabinet, formed June, 1865, he was minister of finances and of the colonies, in which position he presented to the Cortes the project of a law for the abolition of negro slavery. He was banished shortly before the revolution of September, 1868. In the constituent Cortes, of which he was a member, he combated the formation of a democratic constitution and favored the restoration of the Bourbons. He was one of the chiefs in the movement which brought Alfonso XII. to the throne. He became, in December, 1874, president of the regency ministry, and after the accession of the new monarch he remained at the head of the cabinet. He retired in September, 1875, but was recalled to the presidency of the council in December of the same year, and charged with the direction of the first legislative elections of the new régime. He was himself elected to this new Cortes by the city of Madrid in January, 1876. King Alfonso conferred on him the order of the Golden Fleece. His historical and literary labors also gained him admission in 1867 into the Spanish Academy. In 1879 he again became prime minister, but resigned in March of that year, to be recalled on December 9th to form a new ministry. He again resigned in February, 1881, before the strong opposition of the Liberal party, which was hostile to his reactionary measures as premier.

CANROBERT, François-Certain, a French marshal, was born at St. Céré, Lot, June 27, 1809. He served several campaigns in Algeria, became a colonel in 1847, a general of brigade in 1850, and general of division in 1853. In the Crimean War he led a division at Alma, September, 1854, and succeeded Saint-Arnaud as commander-in-chief in the same month. The allied armies then besieged Sevastopol, and defeated the Russians at Inkerman, Nov. 5, 1854. He resigned the chief command in May, 1855, returned to France, and was made a marshal of France in 1856. In the war against Austria he commanded a corps at Magenta and Solferino, June 24, 1859. He commanded in 1870 an army corps in the Franco-German War in several battles around Metz, and was shut up in Metz with Bazaine. Having been taken prisoner in October, 1870, he was detained some months in Germany. After the fall of the Empire he continued to be a Bonapartist, and was elected a senator in 1876 for the department of Lot. He was re-elected in November, 1879.

CANTICLES, Book of. The article in the Encyclopædia Britannica rejects all the allegorical interpretations of this book and regards it as an ancient Hebrew love-poem. No fault is to be found with this view. But on this theory the very simplest interpretation is the best, and the simplest interpretation makes the book an idyl of monogamic married love between the Shulamite and her husband. So far as Solomon is concerned, whether we regard him as the husband of the Shulamite or not, we have here an ideal marriage—a condition of things which might have been, pictured in contrast with the magnificence of his harem and all the luxuriousness which surrounded him, and making the latter seem pitiful by comparison. And there is no ground for any of the interpretations which represent the Shulamite as either accepting or repelling unlawful and indelicate attentions on the part of any one. The alleged expressions of sensuality are merely instances of mistaken exegesis. For example, the Shulamite compares her husband in the daytime, when he is abroad attending to his affairs, alert and vigorous, to an antelope bounding over the mountains.

See Vol. V. p. 29 Am. ed. (p. 32 Edin. ed.).

She compares him when he is at home at night to the antelope quietly feeding by night among the lilies at the edge of the water. This figure, and allusions to it, are several times repeated. The interpretation which understands these passages as parallel to certain passages in Swift or Sterne or Lord Byron is unworthy, and is as far as possible from the meaning of the original. There is no occasion, therefore, to defend the book against these interpretations by guessing, in contradiction to all the evidence, that the passages in question are interpolated corruptions of the text.

The fact that some Jews, as late as the close of the first century A. D., were in doubt as to the canonical character of the book, does not show that up to that time it had been omitted from the Old-Testament Canon, and therefore had been more subject than the other books to a change of text, but rather that, though it had always been regarded as scriptural, it had yet been less used, and was consequently less known, than some of the other books. (See BIBLE.)

Moreover, if we regard the book as a simple idyl of married love, we do not thereby deny its right to claim a place in the Canon on the ground of its religious character. Perhaps its merely ethical teachings as to love and marriage would constitute for it a sufficient claim; but its title is not restricted to this ground alone. The pure but eager and whole-hearted love in marriage in its highest type is the best possible illustration of certain aspects of the love which ought to exist between God and man; and this use of the book of Canticles should be promoted, and not hindered, by the realistic interpretation now current.

It has been inferred from the mention of Tirzah in Cant. vi. 4 that the book was written while Tirzah was the capital of the kingdom of Israel under Baasha. But it appears from 1 Kings xiv. 17 that Jeroboam also lived at Tirzah. In the account given in the Vatican copy of the Septuagint in the long added passage found after 1 Kings xii. 24 this name appears twice, indisputably, as *Sarira*. The same account affirms that Jeroboam, in the days when he was the servant of Solomon, built for Solomon "the Sarira in the mountain-country of Ephraim," as well as the fortifications at Jerusalem. Now, it is commonly said that this particular Greek copy also gives Sarira as the equivalent of Ts'redah, the birthplace of Jeroboam. This might easily be otherwise explained. But even if it be true, the Sarira in Mount Ephraim, the city from which Jeroboam's wife went to Shiloh and returned, must have been Tirzah, and not Ts'redah. According to this account, therefore—which certainly has some historical validity—Solomon built Tirzah, employing the same man to direct the work whom he employed in similar services in Jerusalem. The view, therefore, that Solomon is the author of this book not only accounts for the prominence with which Tirzah is here named, but also for the mentioning of Tirzah in connection with Jerusalem. This latter point is very difficult to account for on the theory that the poem belongs to the times of Baasha or Omri, for the relations between Tirzah and Jerusalem were then not such as would lead any one to mention them both lovingly in the same breath.

But independently of this branch of the evidence, most scholars think that they have sufficient proof that Solomon was the author of the Canticles. In the introduction to Green's translation of Zöckler's *Commentary on Canticles* in Schaff's edition of Lange is a full and successful discussion of this question by the author and the translator, including a summary of arguments by Delitzsch and Hengstenberg. The following extract gives a general idea of the nature of the proof of the Solomonic authorship of the book: "That Canticles was composed in the age of Solomon as the flourishing period of the Old-Testament Chokmah literature may be argued not only from manifold indications of the affinity between its ethical tendency and view of the world and those of Solomon's collection of proverbs, but chiefly from the certainty with which its author deals with all that is connected with the history of the Solomonic period; the exuberant prosperity and the abundance of native and foreign commodities, whose existence he assumes in Israel at that time, and the remarkably rich round of figures and comparisons from nature which is everywhere at his command in his descriptions. And that this author is no other than Solomon himself is shown by the extensive knowledge which he exhibits throughout the entire poem of remarkable and rare objects from all of the three kingdoms of nature, and by which he may be most unmistakably recognized as the wise king who was able to speak 'of trees, from the cedar tree that is in Lebanon even unto the hyssop that springeth out of the wall; also of beasts and of fowl and of creeping things and of fishes,' 1 Kings v. 13 (iv. 33). Solomon's authorship is likewise confirmed by the equal acquaintance which the poet shows with all parts of the land of Israel; the easy and familiar way, indicating not only accurate knowledge, but royal possession and ownership, in which he speaks of horses in Pharaoh's chariot (i. 9), of wood from Lebanon (iii. 9), of the tower in Lebanon looking toward Damascus (vii. 5), of the pools of Heshbon and the forests of Carmel (vii. 5. 6), the tents of Kedar and the mountains of Gilead (i. 5; iv. 1), of the beauty of Tirzah and the loveliness of Jerusalem (vi. 4; cf. iv. 4), etc. The peculiarities of the language of the poem, rightly estimated, likewise testify rather in favor of than against Solomon's authorship. For the Aramæisms and apparent traces of later usage which it presents are, like similar phenomena in the Song of Deborah, in the book of Job, in the prophet Amos, etc., to be attributed entirely to its highly poetical character. And the occurrence in individual cases of foreign non-Semitic words (*e. g.*, פַּרְדֵּס, iv. 13; אַפִּרְיוֹן, iii. 9), if this were actually proven, would be least surprising in a writer of such many-sided learning and of so universal a turn of mind as Solomon. And, finally, the contents of the piece are of such a nature as not only to admit, but actually to favor, the supposition that Solomon is the author, provided that in ascertaining these contents we discard the common assumption of the profane erotic exegesis that this king is introduced as the seducer of the innocence of a country maid, who adheres with steadfast fidelity to her betrothed." (W. J. B.)

CANTON, a city of Fulton co., Ill., is on the divide between the Spoon River and the Illinois River, 28 miles W. S. W. of Peoria, and at the intersection of the Buda branch of the Chicago, Burlington, and Quincy Railroad and the Peoria division of the Wabash, St. Louis, and Pacific Railroad. It has three hotels, three banks (one national), three weekly newspapers, seven churches, and five schools. It has a foundry, a factory, two flour-mills, and two large manufactories of agricultural implements. It was settled in 1831, and incorporated in 1849 with a temperance charter. Its property is valued at $1,000,000; its public debt is $2000, and its expenses for 1881 were $10,000. It is neat in appearance and lighted with gas. Population, 3762.

CANTON, the county-seat of Madison co., Miss., is on the Chicago, St. Louis, and New Orleans Railroad, 190 miles N. of New Orleans and 23 miles N. of Jackson. It has a bank, two hotels, a weekly newspaper, five churches, and good schools. It ships about 20,000 bales of cotton annually. Population, 2803.

CANTON, the largest town of Lewis co., Mo., is on the Mississippi River and on the Keokuk and St. Louis Railroad, 165 miles N. of St. Louis. It has a bank, two weekly newspapers, ten churches, graded schools, and the Christian University, under the control of the "Christian" denomination. It carries on an extensive trade, has two elevators, numerous warehouses, large saw-mill, three planing-mills, three flour-mills, and several manufactories. Population, 2632.

CANTON, the county-seat of St. Lawrence co., N. Y., is on both sides of Grass River, 18 miles S. E.

of Ogdensburg, and on the Potsdam branch of the Rome, Watertown, and Ogdensburg Railroad. It contains a court-house and jail, both built of Potsdam red sandstone, clerk's office of gray marble, three hotels, two weekly newspapers, an opera-house, six churches, a union school and an academy. It has also two foundries, two flour-mills, saw-mill, tannery, boat-factory, and smaller works. It is the seat of St. Lawrence University, which, besides departments of letters and science, has a Universalist theological school. Its library, founded by Silas Herring of New York, contains 10,000 volumes. The university has three fine buildings, one of which is a memorial hall of Rev. Ebenezer Fisher, D. D., the founder of the theological school. Canton was settled in 1800 by Stillman Foote, and incorporated as a village in 1845. Population, 2049.

CANTÙ, Cesare, an Italian historian, born at Brivio, in the Milanese, Dec. 8, 1807. At the early age of eighteen he was a professor of belles-lettres in the college of Sondrio in the Valtelline. Not long after he changed his residence, first to Como and then to Milan. He ardently embraced the liberal cause, and soon began to write in its behalf. In 1842–44 he published a work entitled *Reflections upon the History of Lombardy in the Seventeenth Century*, which drew upon him the disfavor of the existing government. He was condemned on the charge of conspiracy to one year's imprisonment. He utilized the time, however, in writing a novel called *Margherita Pusterla* and a number of poems, religious and political, in which he shows a devotion to liberty and great loyalty to the papacy, which he considered the principal factor in the redemption of Italy. Numerous articles in the *Biblioteca Italiana* and other journals are written in the style of the romantic school of Manzoni and Silvio Pellico. His principal work is a voluminous *Universal History* (1st ed. 1837; 9th ed. 1864). Its popularity was so great that many editions appeared in rapid succession in Italy, and it was translated at once into English, French, and German. As he disliked Voltaire and the French literati, he has depreciated France in this work, especially in the eighteenth century. In 1851 he wrote a valuable *History of Italian Literature.* Among his other works are a *History of the Last Hundred Years* (1864), a *History of the Italians* (1st ed. 1854; 2d ed. 1857–60), *The Italian Parnassus: Contemporary Italian Poets, Greater and Less*; and a poem, *Algiso; or, The Lombard League* (1828). He was admitted to a seat in the Vatican Council in 1869, and appointed its historiographer. Some of his fictions have been in part autobiographical. Although favorably known as a poet and a novelist, his chief claim to literary reputation is as a philosophic historian. Among his later works are *Gli Eretici d' Italia* (1867); *A History of Italian, Latin, and Greek Literature* (1863–64); *Cesare Beccaria e il Diritto Penale* (1864); *Chiesa é Stato* (1867); *Dell' indipendenza italiana* (1870); *Reminiscenze su Alessandro Manzoni* (1882). (H. C.)

CANVAS-BACK, a kind of duck of the family *Anatidæ*, sub-family *Fuliguline*—the *Fuligula vallisneria*, sometimes placed in the genus *Aythya*, sometimes also made type of a distinct genus, *Aristonetta*. The specific name is derived from the "wild celery," *Vallisneria spiralis*, of which the bird is especially fond, and from feeding upon which its flesh acquires the peculiar flavor so well relished by gourmands, the name of the hydrocharidaceous plant itself being derived from that of Antonio Vallisneri, an Italian naturalist (1661–1730). This kind of tape-grass or eel-grass grows in most parts of the United States and many other countries; it is abundant in Chesapeake Bay, which is consequently the winter resort of great numbers of canvas-backs. The bird is about 20 inches or so in extent of wings; the wing, 10; tarsus, 1¾; the bill, 2¼ or more, measured along the culmen, with median nostrils. The size and shape of the bill are the principal specific characters in comparison with closely-related *F. americana*, or red-head duck, which is not seldom sold and eaten as the canvas-back. In *F. vallisneria* the bill is not shorter than the head, narrow and nearly parallel-sided throughout, and very high at the base, where it rises with a long, gentle slope in line with the forehead. In *F. americana* the bill is shorter, wider, lower, and meets the forehead out of line with the great convexity of the latter; the nostrils are sub-basal; the bill is also bluish, with a black belt near the end, whereas in the canvas-back the bill is dusky throughout. The male canvas-back has the head and upper part of the neck dark chestnut, much obscured on the head with dusky; the back ashy white, finely rayed transversely with narrow, broken, and zigzag lines of blackish, from the effects of which vermiculation comes the name; the lower neck, breast, flanks, and crissum blackish; the wing-speculum slaty-bluish; the feet dark slate; the eyes red. In *F. americana* the back is mixed silvery-gray and blackish in about equal amounts, the dark lines being broader and not so much broken into dots; the effect is thus different. The head is bright chestnut-red, with a coppery lustre. The female canvas-back is smaller than the male, and has the head plain dark snuff-brown, but may be recognized by the shape of the bill and other characters. The canvas-back inhabits North America at large, but is particularly abundant along the Atlantic coast of the United States; it breeds chiefly far north, but certainly also down to the northern border of the United States at ordinary elevations, and still farther south in alpine localities. The flesh is not specially excellent under ordinary circumstances. The bird feeds upon the root of the *Vallisneria*, which is procured by diving for it and pulling it out of the mud. It is frequently the unwilling purveyor of the widgeon and other ducks equally fond of the wild celery, but unable to dive for it. Immense numbers of the birds are annually destroyed for the markets by professional gunners as well as by amateur sportsmen, the pursuit of this water-fowl being an extensive industry, systematically pursued under various regulations and restrictions, the object of which is to prescribe methods of taking the birds, and thus prevent wholesale destruction by the poachers, who use floating batteries and other contrivances by which the game is unduly harassed on its feeding-grounds. "Toling" is another method by which the birds, though they do not fly to a decoy, may be allured toward the shore by the display of some unusual object. Wing-shooting is the sportsman's method, practised from blinds or screens (E. C.).

CAPE GIRARDEAU, a city of Cape Girardeau co., Mo., is on the Mississippi River, 150 miles below St. Louis and 40 miles above the mouth of the Ohio River. It is the terminus of the Cape Girardeau and Southwestern Railroad. There are three hotels, one bank, three weekly newspapers (one in German), eight churches, and six schools. St. Vincent's College, a Roman Catholic institution, was established here in 1844, and there is also a State normal school, which is well attended. The industries comprise one foundry, three stave-factories, five flour-mills, and a paint-mill. The first settlement was made in 1794, and in 1824 it was incorporated as a city. Its property is now valued at $600,000; its public debt is $119,600, and its expenses for 1881 were $10,000. Population, chiefly of German origin, 3889.

CAPEL, Thomas John, an English divine of the Roman Catholic Church, was born at Hastings, England, Oct. 28, 1836. At the age of fifteen his education was continued by Rev. J. M. Glenie, under whom he studied for six years. In 1854 he become one of the founders and vice-principal of St. Mary's College, Hammersmith. Here his health broke down from severe work, and in 1858 he went to the Continent to recruit, shortly after having been ordained by Cardinal Wiseman. During his absence he established an English Catholic mission at Pau, and was appointed its chaplain. Having regained his health, he returned to London, where he gained great reputation by his oratorical powers and attracted overflowing congregations. He was afterwards appointed chamberlain, and in 1873 domestic prelate, to the pope, with the title of monsignor. During the Œcumenical Council at the Vatican he delivered a course of lectures which drew immense audiences. In 1876 he gave a similar course with equal success. In 1873 he established the Catholic public school at Kensington, London, and was afterwards appointed rector of the Roman Catholic University College at Kensington. His sermons are particularly devoted to the exposition of doctrinal points, and he has made many converts to his Church from all classes of society.

CAPE MAY, a city and famous watering-place of Cape May co., N. J., at the southern extremity of the State. It is the terminus of the West Jersey Railroad, 81 miles S. of Philadelphia, and has also in summer a line of steamboats. It has gas-works, water-works, two local railroads, two weekly newspapers (which in the summer issue daily editions), six churches, public and private schools, and good drainage. During the summer it has hotel accommodation for 8000 guests. It is one of the oldest seaside resorts in the United States, and was incorporated as a city in 1855. It has had numerous fires: in 1855 the immense Mount Vernon Hotel was destroyed; in 1869, seven hotels were burned; and in 1878, fourteen hotels and buildings, covering an area of 40 acres, were destroyed. Since 1879 it has had a paid fire department. During the summer the population exceeds 10,000. Resident population, 1699.

CAPIAS, in law, a writ issued in civil cases commanding the sheriff to take the person of the defendant into custody.

A *capias ad respondendum* is the writ which was formerly used to begin almost every personal action. In very early times it seems that the person of a defendant in a civil action was not liable to arrest except where the injury complained of was accompanied with force and amounted to a breach of the peace. By stats. 52 Hen. III. c. 23, 13 Edw. I. c. 11, 25 Edw. III. c. 17, and 19 Hen. VII. c. 9, however, this immunity was done away with, and a capias became in consequence the usual writ in all civil actions, even though they sounded exclusively in contract. In order, however, to entitle the plaintiff to this writ of capias it is almost universally required that he should make affidavit of his cause of action. The defendant when arrested under a capias will only be discharged on giving satisfactory bail for his appearance, which must usually be approved by the court.

A *capias ad satisfaciendum*, or, as it is usually termed, a *ca. sa.*, is a writ in the nature of a writ of execution issued after the obtaining of the judgment. It directs the sheriff to secure the person of the defendant and to imprison him until the amount of the judgment is paid. The effect of the issuing of a *ca. sa.* is at common law to prevent the suing out of any other process of execution against either the lands or chattels of the defendant. This rule is, however, modified in modern days in some localities by statute.

By stat. 1 & 2 Vict. c. 110, and by many subsequent acts of Parliament, the use of writs of capias has been in England almost altogether done away with. By stat. 32 & 33 Vict. c. 62 it is provided that except in certain rare cases therein specified no person shall thereafter be arrested or imprisoned for making default in payment of a sum of money, and further, that no person shall be arrested on mesne process in any action unless the plaintiff shows to the satisfaction of the court that he has a good cause of action for £50 or over, and that there is good cause to fear that the defendant is about to leave the country to the plaintiff's prejudice. Provision is, however, made for the punishment by imprisonment of all fraudulent debtors alienating, destroying, removing, or concealing their property.

In the United States writs of capias—or, what practically amount to the same thing, warrants of arrest—are still allowable in all cases sounding in tort or where the defendant has been guilty of fraudulent conduct. The plaintiff cannot, however, where the real gist of his action lies in contract, entitle himself to a capias by electing to bring an action in tort.

Other forms of the writs of capias were in former times occasionally used, but have now become obsolete. Such were the capias *ad audiendum judicium*, the capias *ad computandum*, the capias *pro fine*, the capias *utlagatum*, and the capias *in withernam*. (L. L., JR.)

CAPITAL has been extended in meaning until it has become, not synonymous with wealth, but a differing form rather than a differing substance of social force. Wealth comprises all matter and all privilege useful to man. But these matters and these privileges may exist in a form useful to the individual owner only. A drove of bullocks grazing in the valleys of the Rocky Mountains before the opening of the Union Pacific Railway was an article of wealth. In crossing the arid deserts eastward to the market, though their skins and bones might remain, their exchange value would fall so low that it would not pay the cost of driving them over. This drove of cattle, which represents the early form of capital, illustrates the constant difference between wealth and capital. While the drove exists among the grasses of nature it has a certain value to the owner. Put it on a railway, or carry it along pastures where it can keep its flesh, and it becomes capital, an article of wealth which can be *told off by the head* or pass from hand to hand, the representative of value and the medium of exchange. The land on which the grass grew which nourished the cattle goes through the same social evolution. Useful to the owner while in its remote condition, it had yet no value as a means of civilization; when connected with a market or series of markets an acre of it might be bought and sold, might be made a basis of exchange in New York or London, and thus might become capitalized or told off into capital.

It is this essential social character of capital which escaped the notice of the early writers on political economy, and has been recognized but dimly since. Adam Smith classified wealth into stock in two divisions, the second of which should be capital. His first division of stock he then divides again, not quite clearly. His division of capital he analyzes into *fixed* and *circulating*. Notwithstanding all this classification, Mill pushes farther, saying, "The distinction, then, between *capital* and *not-capital* does not lie in the kind of commodities, but in the mind of the capitalist—in his will to employ them for one purpose rather than another; and all property, however ill adapted in itself for the use of laborers, is a part of capital as soon as it, or the value to be received from it, is set apart for productive reinvestment" (*Political Economy*, book i. chap. iv. § 1).

The continuation of these abstractions produced the curious fantasy of the *Wages Fund*, the dogma of productive and unproductive consumption, and other economical theories which cannot be reduced to the test of ordinary experience.

The French writers, with all their power of analysis, have not improved upon the English economical definitions of this word. Say departed from Smith's course, making *capital* the equivalent of the latter's *stock*. This was not a gain, for Smith and Matthews make *stock* the whole and *capital* a part, which is certainly a well-grounded distinction. McCulloch makes *stock* the genus and *capital* the species. These distinctions should not be obliterated, unless we replace them with clearer terms, something which shall make a more definite analysis; and the French have not done this. They introduced *fund* or *funds*, but that term only became more confused than "capital." And, finally, Larousse says the English should follow Smith, while "French economists must always use *capital* in two very different meanings, according as it is employed in common language or as a term of exact science." But there is nothing national or race-descended in the term *capital.* If there is anything natural and common to humanity, it is in the desire, use, and possession of worldly goods. Roscher treats it in a learned and thorough manner, but he adds no new principle. He disputes the statement of Karl Marx, that "capital is money which begets money. This opposes the true nature of merchandise, value, money, and circulation. This opposition benefits but one of the three men who transact business" (*Das Kapital*, p. 139).

The French say, "All our capitals, all our riches, spring from our faculty of accumulating, sparing, and preserving." We believe all economists agree in this feature of capital: abstinence or parsimony is an essential part of this particular form of wealth. It is a commodity or commodities saved to be applied to reproduction, as distinguished from those things which are consumed. The idea of the individual user or consumer seems to have been always present in their minds, and to have limited all the definitions of capital. But saving or consumption, while it affects wealth as such, affects capital not at all as distinguished from wealth.

Consumption may be needed to make wealth into capital. What drew our bullock out of the Rocky Mountains and converted him from idle wealth into active capital? Was it not the fact that somebody was waiting to eat him where bullocks were scarce and money was plenty? What is the best form of capital to-day? Every one will answer, A British consolidated 3-per cent., a United States 4-per cent., or any equally convertible Government security. Even Marx, whatever may be his notions of government, social order, and economical rights, would carry this form of capital to London, New York, Canton, or Capetown, rather than a bag of gold, a cargo of wheat, or a sack of diamonds. The bonds have all the value of the commodities, in that they will exchange for them at a trifling discount, or even at a premium, wherever civilization exists; and they have the additional value of the interest accruing besides. While the owner has been travelling his capital has been working, and its representative, the bond in his pocket, has been increasing. It represents more wheat, gold, or diamonds—balancing exchanges being equal—in Canton than it represented in London before the journey commenced.

This bond is not wealth in substance, but in limited amounts it is the best instrument of wealth humanity has ever invented. In essence it is the inverse, the absolute opposite, of wealth. Generally speaking, it is founded, so far as it has any relation to wealth or commodities, on saved products which have been consumed, fired away in cannon, eaten by armies, wasted in wars. It may represent a solid work of industry like the Suez Canal or the Union Pacific Railway, but as a rule Government bonds represent lost wealth and wasted products. Whatever it represents historically, in substance it is one; it is a social obligation. It is an obligation to pay, a debt, a piece of debit-credit, which must be met by future savings and abstinence. It differs from that wealth which is not capital in that it has not been saved, but will be saved; then its personation of wealth will be completed; it will be liquidated, paid, and destroyed. But it may be a more useful tool during its existence, it may create more actual wealth and commodities, than the plough creates in the same time, if it be put to the highest uses of civilization.

We can hardly conceive of capital in the modern sense without some form of credit entering into it. Credit is order well distributed. Negotiable paper, collectable accounts, bank deposits, bank or other circulating notes,—all these become admirable forms of capital in any civilized community. And we must observe that consumption enters into them all in different degrees, but with equal certainty. Why does a man carry a bit of paper money instead of the indestructible diamond if it is not that his immediate desire to expend may be gratified? The diamond is a more solid form of wealth, and is getting to be a highly convertible form. Why does the merchant or financier carry negotiable notes, mere personal securities, in his pocket-book, when he can have the security of land and solid buildings for his property? It is that he may have the privilege of converting this capital into other capital or commodities at the need of the market. It is true that the operation of the market is an exchange, and is simply commercial, but this exchange is prompted and impelled by a personal want and accumulation of wants, which is never absent from the transaction in its essential nature.

It is this process of transmutation of wealth and capital which brings capital into such close relations with labor, and even gives it a fancied antithesis to labor in all the discussions affecting it. We put aside barbarism, and wherever society exists there we find labor and capital working together; for they cannot work separately and they cannot exist separately in a civilized sense. Capital is the first social factor. Labor is the effort of an individual, but is none the less a social transaction. The laborer was so long considered a client, vassal, or feudalized dependant that many writers treat him still as a social dependant. Then they consider him a dependant who has been wronged, deprived of his own, and entitled to an especial reward in consequence. But neither labor nor the laborer created society. Society created him, and created the opportunity which continues his existence under the effort of labor. Whether he be born czar of Russia or the child of the meanest tenement-house in New York, he cannot escape the obligation to his swaddling-blanket. All his duties are social, all his rights are social. The man who uses a shovel to earn his daily bread did not invent the shovel. This tool was created through long generations of development, use, abstinence, consumption—the *social need*, in short, which has impelled every society, simple or complex, in its onward movement.

The wrongs of labor are many, and cannot be too carefully regarded by society. But they do not affect the essential, economical nature of capital any more than the bleeding stripes of the slave affect the color of the diamond which his oppressed labor draws from the mine. In America every laborer can, and most laborers do, possess themselves of capital. This is the only way in which the social balance can be righted if capital inclines it against labor. It is in the nature of capital to move; wealth may lie idle if the owner chooses that form of gratification. But capital must be put into the social current, and be held always subject to the want of one or many. It loses its nimble qualities, its faculty of being told off by the head at any time, unless it thus pulsates with the daily life and want of mankind. The laborer must move with it, and thus catch some of the social force which is engendered with every forward movement in the world's life.

This current of civilization, this in-and-out flow of capital and labor, which enters into all transactions, large or small, and which constitutes the daily business of life, must be formulated in a term which partakes of the nature of both. The banker and trader, the manufacturer and farmer, do not hold all the functions of the middleman. The employer, the French *entrepreneur*, is not the sole social agent in the intercourse of capital and labor. The hiring of labor or the selling of its products is a small part of the social business which is transacted in every movement of life, great or small. Whenever capital and labor are loosened, started, or employed a new product is created, and the old ones are destroyed in the process. This highly sublimated social process we term *capitalizing*, and the person who at the moment carries it forward is a *capitalizer.* One man does not always hold the function; no more is one man always a banker or always a laborer. It is a social function, and may in turn be put forth through many and varied individuals. Any farmer selling a bushel of corn, any laborer planting potatoes in his cottage-garden or depositing his earnings in a savings bank, becomes a capitalizer, with all the power which society, through its manifold wants, enshrines in capital.

The deeper thinkers among the Socialists have penetrated the fact that it is not the mere possession of property and wealth which institutes the inequalities among persons. They have desired to seize this social movement, this capitalizing, this whole ordered movement of capital and labor, credit and business—to establish in the state itself a power which should distribute absolutely to each individual all the benefits now intercepted by the social administrator, the capitalizer, who at each turn of society momentarily interprets the social want. It would be about as easy to catch all the rainfall, and distribute it more equally by artificial showers over the whole country, as it would be to reconstitute the present order of trade and employment and by bureau service and state manipulation administer the manifold wants of society.

The idea of profit worried Marx especially. The begetting by money, not only in usury, but also in trade and exchange, he considers to be wrong in substance. There can be only one person benefited by the present social movement of capital, while two are injured. It will be observed that he loses sight of the social nature of capital, which we have defined so urgently, and makes it a personal power, something inhering in the possessor. We cannot pursue this idea of Marx, but it ends logically in nihilism, financial, civil, social. All heredity, all limitations of marriage, all property, all profit in exchange, all governmental control except the immediate vote of an assembly, must be abolished in this system in order that equality may assume sway and each individual may have his own.

Proudhon devoted a powerful intellect to the solution of social issues. He declares that "capitals are tools inert in themselves." Less radical than Marx, he would have an association of producers and consumers, who by reciprocity and exchange of products would escape for ever the "domination of capital." Then would follow "abolition of exploitation in all its forms;" "gradual and pacific annihilation of the action of capital;" "creation of gratuitous credit;" "security and equitable reward of labor;" "emancipation of the proletariat." The form is different, but the social change is about as great as that advocated by Marx, in so far as capital is affected. It is government made easy, every man his own banker, every man his own employer and laborer, and all taught and managed by the state. But who would teach the teachers? Mill says pineapples are needless; so is the third slice of bread at a meal. Two slices would sustain existence, but many find life easier if they commute the third slice into pineapple. Others like to wear jewelry, and who shall say that either is wrong in the social scale?

Public sentiment may change the use and distribution of wealth through ethics. The American Revolution destroyed the tea—which was capital—in Boston harbor. A "higher law," as it is called, came in and superseded the economic law. After King George and the rebels were reconciled, after the moral disorder ceased, tea became useful again. It was the same pound of tea always, but the social mood changed its value and power.

Society acts ethically through public sentiment, but it has no economical interest in the use an individual makes of his wealth or capital. The bottle of brandy which intoxicates a human brute sells at the same price with that which rescues an invalid from death. In order that the social movement may go on and capital be created and re-created, it is essential that there be consumption, as we have shown. Brandy may be used well or ill, but it can never be other than a good substance of wealth, a good form of capital, economically considered. It is a certain value in exchange; a runlet of brandy carried into any part of the world will have a more certain value than a sack of wheat.

The antithesis of labor and capital is wholly artificial, if we consider the social energy of capital as above stated. It is not that there is any particular fund devoted to labor, but because all individual members of society participate, through the power of the market, in the social movement which creates, nourishes, and forwards capital. The owner might have kept his bullocks in the Rocky Mountains to gratify his whim or greed. They might die amid an over-abundance of cattle, and thus do the world no good. The moment they became capital, convenient and commodious, the world was better fed. If calicoes are abundant, the laborer gets more of them. If tobacco advances in price, more is planted and his pipe is soon filled more cheaply. More capital means more commodities—a greater return to each member of society, whatever the rate of wages may be.

Capital increases, in money first, then interest lowers, production is stimulated; products—commodities—multiply, prices lower, consumption extends. This is true in principle, and it is true in historic fact. Wherever any thrift has been exercised consumption has extended to more and more individuals in the great community of society. It is not peculiar to any class of individuals. Capital is not a creature devouring society, nor are capitalizers—creators of capital—monsters preying on the other members of society. The commodity is always the same—bread, brandy, or gold—while the individual capitalizers are social agents, imperfect fellows, construing in a faltering way the social wants they see around them, and which become the breath of their nostrils. The Rocky Mountain grazier did not eat any more beef because the bullock was converted into capital; neither did the butcher in Liverpool nor did Rothschild, who furnished the exchange in London, the magnet which drew the bullock across the seas. No one of the party could eat more than one beefsteak, however his so-called capital, "the share of the capitalist," might increase. Rothschild out of his profits bought a diamond perhaps, but that did not increase the price of the steak sold in Liverpool or Manchester. Capital is created out of individual wants, organizing through highly-trained individuals—not mere employers and traders, but social agents—into social wants.

In order to forward and complete this process we must give the individual free play in his wants, or we shall not get the full economic power of capital, although we may have sluggish and inert wealth. The best social order ensures wealth most surely, and still more stimulates the creation of capital, the servant of both wealth and labor. Capital surely increases the means of communication, and laborers, using these improved travelways, now find their best opportunity. Poor as the United States was three-quarters of a century since, the French economist Coquelin saw that its more active employment of capital and credit would give it the advantage over richer England and France. The result has justified his sagacity. Civil order, the freedom of the individual, elastic capital,—these are the effective elements of modern wealth. Out of these factors comes the social movement we have sketched.

We close with the following summary:

1. Capital is a part of wealth, the more fluid part.
2. Capital is convertible value, that part of society's substance which is available for any want.
3. Capital is a social substance, which, combining with labor through a social agent, becomes a new substance in accord with the desire of society. (W. B. W.)

CAPITAL PUNISHMENT is the taking, by due process of law, of the life of an offender as a punishment for the commission of a public offence. Formerly, nearly all offences, except very slight ones, were punishable, in England, with death, and sentence thereof was imposed, though in very many cases a commutation to imprisonment was granted by the Crown. This rendered the administration of criminal justice very uncertain, as courts and juries, not knowing whether a commutation would be granted, were loath to trust to an uncertain clemency. Courts quashed indictments or held them invalid, or on the evidence discharged the accused, on the most technical and absurd grounds, thus rendering criminal law the subject of criticism and ridicule. In a recent case (Fralich *v.* People, 65 Barbour, 51) the court said: "When objections like those insisted on by the counsel were available, the prisoner was refused the aid of counsel and the right to examine witnesses in his own defence. The courts were, under the circumstances, compelled to interpose these technicalities in order to save the accused from an unjust conviction. Many of these rules are still permitted to shield offenders from punishment due to their crimes, although the reasons which justified their adoption have long since passed away. It is the application of these absurd technicalities, at this day, that is bringing the administration of criminal law into contempt. We are gradually getting rid of them, and the courts are applying the more wise and safe rule that no error shall avail a prisoner to escape punishment unless it manifestly appears that it may have done him some material injury."

Criminal laws cannot be successfully or efficiently enforced unless sustained by public sentiment. If these laws are popularly regarded as cruel or unjust, juries will disagree or acquit, notwithstanding the strongest and most emphatic charges from the bench. When the criminal might be executed for stealing a sheep as well as for murder, he had not the slightest inducement to refrain from murder if he was detected in the act of carrying off the sheep. Nor was this the worst effect of the criminal law as it existed in England in the last century. Not only the thief caught in the act of theft, and with the instinct of self-preservation brought strongly into action, but persons the least criminally disposed, with ample leisure for reflection, were necessarily affected by the national sentiment (as expressed in the national laws) that it was no greater crime to kill a fellow-Englishman than to pick a pocket.

With the advancement of civilization and the formation of more humane views the abolition of capital punishment, except for murder and a few other atrocious crimes, began to be agitated. Sir Samuel Romilly did much to bring about the desired result. Sir James Mackintosh was a worthy successor in the same work. In 1832, 1833, and 1835 the number of capital crimes was largely reduced. Lord John Russell still further reduced the list of capital offences. Since 1861 murder and treason have been the only offences capitally punishable in England. •Corresponding efforts in the cause of humanity followed in the United States. In April, 1841, a select committee of the assembly of the State of New York presented an elaborate report upon the subject, recommending the abolition of capital punishment and substituting imprisonment for life for all crimes then punishable by death, with the proviso that in cases of treason, murder, and arson in the first degree, the governor should not have power to pardon, but might order a new trial in the court in which the conviction was had on the discovery of any new and material evidence in favor of the accused. Where abolition of capital punishment for murder has been tried it has not proved beneficial. Perhaps the State of Maine presents the best illustration of its effects. In that State in 1837 the law was so amended as to make its infliction optional with the governor. He very rarely awarded this extreme penalty, and, as a consequence, murders increased to such an extent that in 1860 Maine had "become notorious for its murders." Nevertheless, from 1834 to 1864, a period of thirty years, not an execution took place. At length a State-prison convict murdered his warden, and for this act, singularly enough, he was hung by Gov. Corry, as if the slaying of a prisoner's natural enemy were a more atrocious crime than the murdering of a wife or a friend. So illogical an enforcement of the capital law of course produced little effect outside of the prisons, and murdering went on till Gov. Chamberlain executed Harris, a negro, for the murder and rape of two old women. His successor, Perham, refused to enforce the law, and capital crime soon proceeded more rapidly than ever, until the legislature passed a law restoring the death-penalty without evasion, and Wagner and Lowell were hung for the murder of five or six victims, men, women, and children. The effect of the new law and its strict enforcement was very striking. During the entire year following its passage only one homicide occurred in Maine, and in that case the murderer committed suicide immediately after the commission of his crime. Yet, in the face of these facts, in 1876 the legislature abolished capital punishment. The result of one year of the law of 1876 was more striking than the effect of the law restoring capital punishment. Barely a year had elapsed from the adoption of the last law before eleven cruel and unnatural murders had been committed in the State.

In Massachusetts prior to 1876 a sentence of death could not be executed until a warrant had been issued by the governor, with the advice of the council, commanding the sheriff to cause execution to be done. The operation of this law was extremely bad. Criminals convicted of murder and sentenced to death had the chance not only of obtaining a pardon, but of profiting by the refusal or neglect of the governor and council. The delay and uncertainty of execution which were incidental to this practice had done much to deprive the sentence of death of its proper influence on the public. In 1876 the legislature, to remedy this evil, passed a law making it the duty of the court, in pronouncing sentence of death, to appoint a time for its execution, and that a warrant should issue under the seal of the court commanding the sheriff to cause execution to be done. In 1860 capital punishment was practically abolished in New York (*Laws 1860*, ch. 410, p. 712), but so great was the sudden increase of murders in that State under that law that in 1862 (*Laws 1862*, ch. 197, p. 368) the legislature was compelled to restore capital punishment in cases of murder in the first degree. The effect of the law of 1862 was an immediate and a marked falling off in the number of murders occurring in that State.

Iowa abolished capital punishment in 1872 (ch. 736, *Laws 1872*), and restored it in 1878 (ch. 165, *Laws 1878*).

Study of these facts cannot fail to show that the abolition of capital punishment is not advisable. Cases of murder constitute probably the only class of crimes against which public sentiment sustains its enforcement. One who wilfully and deliberately destroys human life ought justly to forfeit his own; because, first, such a punishment deters others similarly inclined from committing a like offence; and, secondly, the lives of others are in more danger from him than from one who has never committed the offence.

The statutes of some States practically enable jurors to decline to inflict the death-penalty except in atrocious cases which clearly fall within the definition of murder in the first degree.

By the Revised Statutes of the United States the death-penalty is inflicted for the following crimes: murder; piracy or robbery on the high seas, the accessory before the fact being adjudged equally guilty with the principal; rape, treason. But the court may sentence a person convicted of treason to imprisonment at hard labor for not less than five years and a fine of not less than $10,000. The following outline shows the grades of crime for which capital punishment is prescribed or allowed by the statutes of the several States:

Arkansas.—Murder in the first degree, rape, treason.

California.—Murder in the first degree, at the discretion of the jury, treason.

Colorado.—Murder, if deliberate or premeditated or done in the perpetration, or attempt to perpetrate, some felony. If human life is lost in consequence of arson, the offence is deemed murder. In all cases a jury shall decide the question of premeditation, etc.

Connecticut.—Murder in the first degree, causing the death of another by wilfully placing any obstruction upon any railroad or by loosening, taking up, or removing any part of the superstructure of a railroad, or by wilfully burning any building or vessel. The general assembly may commute the sentence to imprisonment for life.

Delaware.—Arson, burglary in the night-time with intent to commit murder, rape, or arson, whether the attempt be executed or not, murder in the first degree, rape.

Florida.—Murder in the first degree, rape and kindred crimes; the latter may be punished by imprisonment for life. An accessory before or after the fact in murder is punishable with death or a fine not exceeding $1000, or imprisonment not exceeding twelve months, or by fine and imprisonment, in the discretion of the jury.

Georgia.—Arson in a city or village; arson producing death; murder. But if the jury trying the case shall recommend confinement in the penitentiary for life, the presiding judge shall so sentence: if the conviction is founded solely on circumstantial testimony, the presiding judge may sentence to confinement in the penitentiary for life. Rape, unless the prisoner be recommended to mercy by the jury; treason, same as murder.

Illinois.—Treason; for murder, or arson where a human life is lost, the punishment is death or imprisonment not exceeding fourteen years. The jury shall fix the punishment by their verdict, or upon a plea of guilty the court shall do so.

Indiana.—The following crimes are punishable by death or confinement in the State prison for life, in the discretion of the jury: arson if a life be lost; murder in the first degree; treason.

Iowa.—Murder in the first degree, death or imprisonment for life, at the discretion of the jury, or, if the offender plead guilty, the court must designate which.

Kansas.—Murder in the first degree, treason.

Kentucky.—Arson where human life is lost; murder, death or imprisonment in the penitentiary for life, in the discretion of the jury; treason, death or confinement in the penitentiary, not less than ten nor more than twenty years, in the discretion of the jury.

Louisiana.—Arson; burglary with intent to commit rape, etc.; murder, or poisoning with such intent; rape; survivor of a duel wherein one of the parties was killed; treason.

Maine.—The death-penalty abolished absolutely.

Maryland.—Arson or accessory thereto, death or imprisonment in the penitentiary not less than five nor more than twenty years; burning a public building or conspiring to burn the same, death or imprisonment in the penitentiary for not more than fifteen years; burning or destroying an arsenal or magazine or naval stores or attempting or conspiring to burn the same, death or confinement in the penitentiary for not less than three nor more than ten years; burning an outhouse not parcel of a dwelling-house, etc., death or imprisonment in the penitentiary not less than three nor more than twelve years; carnal abuse of a child, death or imprisonment in the penitentiary not less than eighteen months nor more than twenty-one years; murder, death; treason, death or confinement in the penitentiary not less than six nor more than twenty years.

Massachusetts.—Murder in the first degree, the jury to determine the degree.

Michigan.—Treason. The revision of 1833 punished murder in the first degree with death, but that of 1846 omitted the death-penalty in murder, leaving it only in cases of treason.

Minnesota.—Death-penalty abolished, except that whenever upon the trial of any person, upon an indictment, for murder in the first degree, the jury shall have agreed upon a verdict of guilty of such offence, such jury may also determine that the person so convicted shall be punished by death, and if they so render their verdict the person so convicted shall be punished by death.

Mississippi.—Persons convicted of arson in the first degree, of rape or kindred crimes, or of murder, shall suffer death, unless the jury shall by their verdict fix the punishment at imprisonment in the penitentiary for life. For treason, death.

Missouri.—Murder, first degree, death, the degree to be ascertained by the verdict under instructions of the court; rape, death or penitentiary not less than five years, in the discretion of the jury; treason, death or confinement in the penitentiary not less than ten years.

Nebraska.—Murder in the first degree.

Nevada.—Arson, where a life or lives are lost; murder in first degree.

New Hampshire.—Murder in the first degree, the jury to determine the degree, and on a plea of guilty the court to do so.

New Jersey.—Murder, first degree, aiders, abettors, counsellors, and procurers; treason.

New York.—Murder in the first degree and treason.

North Carolina.—Burglary; the survivor of a duel resulting in the death of one of the parties thereto; wilful murder; rape; an accessory before the fact in any felony punishable with death. The punishment of death in cases of arson only was abolished in 1874.

Ohio.—Murder in the first degree.

Oregon.—Murder in the first degree; treason.

Pennsylvania.—Murder in the first degree.

Rhode Island.—The death-penalty was abolished in this State in 1852, but in 1882 it was enacted that "every person who shall commit murder while under sentence of imprisonment for life shall be hanged by the neck until dead."

South Carolina.—Arson; murder; rape.

Tennessee.—Murder in the first degree, but the court may, on recommendation of the jury, commute the punishment from death to imprisonment for life in the penitentiary.

Texas.—Death occasioned by arson is made murder; murder in the first degree; perjury to a material fact in a capital case if the person accused of the capital felony is convicted and suffers the penalty of death; treason, death or imprisonment for life, in the discretion of the jury.

Vermont.—Arson where life is lost; murder in the first degree, the degree to be determined by the jury on conviction, and on plea of guilty to be determined by the court on examination of the witnesses; treason.

Virginia.—Murder in the first degree; a convict guilty of felony if he kill, wound, or inflict other bodily injury upon one if death ensues; treason.

West Virginia.—Arson in the night-time, death or confinement for life, in the discretion of the jury, but if they find that at the time no person was in the building, not less than five years; a convict guilty of killing an officer or guard or wilfully inflicting an injury from which death ensues; the survivor of a duel resulting in the death of one of the parties thereto; murder in the first degree, except, if the jury convict of murder in the first degree, they may, in their discretion, further find that he be punished by confinement in the penitentiary. If such further finding be not added to their verdict, the accused shall be punished with death; but if added he shall be punished by confinement in the penitentiary during his life, and no pardon shall be granted him unless his *innocence* be established to the satisfaction of the governor. If the accused plead guilty of murder in the first degree, sentence of death or confinement in the penitentiary for life shall be pronounced upon him by the court as may seem right, in the same manner and with like effect as if he had been found guilty by the verdict of a jury. Treason, death or, at the discretion of the jury, by confinement in the penitentiary not less than three nor more than ten years, and by confiscation of his real and personal estate.

Wisconsin.—In this State capital punishment was abolished in 1853.

Capital punishment is required, as it clearly should be, in nearly all the States to be privately inflicted. There is much more terror and more beneficial results in such executions than in those publicly administered. See Cox's *Principles of Punishment*, prefixed to Cox & Saunders's *Criminal Acts;* Beccaria, *Crimes;* Lea, *Superstition and Force;* Coppinger, *Capital Punishment;* Moir, *Capital Punishment;* O'Sullivan, *Capital Punishment;* Pike's *History of Crime;* 133 *North American Review*, 534; Fielding's *Inquiry into the Causes of the Late Increase of Robbers;* Stephens's *History of Criminal Law.*

Modes of Inflicting Capital Punishment.—The Jews frequently stoned their criminals (Lev. xx. 2), but burning alive is also mentioned in the Scriptures as belonging to the earliest times (Gen. xxxviii. 24), and was continued under the Mosaic law in a few instances (Lev. xx. 14). This punishment was frequently inflicted in mediæval and later times upon heretics. The vestal virgins of Rome who violated their vows of chastity were buried alive, and the same punishment is said to have been used by the ancient Britons. Crucifixion was common among the Assyrians, Persians, Egyptians, Carthaginians, Greeks, and Romans. It was abolished in the Roman empire by Constantine, A. D. 330. Garroting by a machine for strangling criminals is the method used in Spain and its dependencies. Beheading, the *decollatio* of the Romans, was introduced into England from Normandy by William the Conqueror in 1076 as a less ignominious mode of putting noble criminals to death. Waltheof, earl of Huntingdon, was the first so executed. The invention of the guillotine is attributed to Dr. Joseph Ignatius Guillotin, after whom it was named, in 1789. It was made a mode of capital punishment in France in 1792. Pellitier, a highwayman, was first executed, and Dangremont was its first political victim, Aug. 21, 1792. Death by boiling was prescribed by statute 22 Hen. VIII (1531). The act was repealed in 1547. The first execution in England by hanging, drawing, and quartering was that of Maurice, the son of a nobleman, in 1241. Malefactors stood in a cart under the gallows, with the rope round their necks, until the signal was given; the cart was drawn away and the criminal was left hanging. Earl Ferrers, who was hanged May 5, 1760, was the first executed by the drop. Hanging in chains, or gibbeting, was abolished by act of Parliament, July 25, 1834. In London the place of execution was usually at Tyburn until 1783. From 1783 to 1868 it was in front of Newgate. In 1868 an act was passed prohibiting public executions, and directing that they take place within the walls of prisons. (N. C. M.)

CAPTURE. Capture of property in time of war has been greatly limited in recent warfare. Public property, says Field in his *International Code*, § 840, must be respected and protected, so long as not used for military purposes, in the following cases: (1) Lighthouses, storm-signals, interoceanic canals, submarine cables, and all structures and establishments exclusively for the uses of peaceful intercourse. (But a belligerent may destroy or impair these for self-preservation.) (2) Palaces and offices of government, halls of legislation and of justice, churches and temples of religion, hospitals, and other establishments of an exclusively religious or charitable character. (3) Museums, galleries of art, monuments and works of art, libraries, books, and manuscripts; observatories and scientific instruments; depositories of state papers and public archives of historical records, scientific instruments, muniments of property, judicial and legal documents, and other institutions of civil education and culture. This rule is sustained by writers on international law, but it is sometimes violated by belligerents.

The rules as to the capture of private property both on land and sea are conflicting. According to strict law, a belligerent has the right to seize and appropriate or destroy any property of the enemy found in the country on the happening of the war; but in practice this right is now seldom exercised. As to private property in the enemy's territory found by an invading army, it is now considered the rule as well as the practice to abstain from any injury, seizure, or molestation except such as military exigencies require. The most difficult question arises upon the right of capture of private property of the enemy at sea. Up to the latter part of the eighteenth century, neutral ships bearing enemy's goods, and neutral goods borne by enemy's ships, were declared by some nations to be tainted with belligerency, and liable to seizure and confiscation. This doctrine, so far as relating to neutral ships, was abandoned by the nations parties to the armed neutrality of 1780. By the Treaty of Paris of 1856 it was declared that "a neutral flag covers enemy's goods, with the exception of contraband of war; and neutral goods, with the exception of contraband of war, are not liable to capture under an enemy's flag." The original parties to the Declaration of Paris were Great Britain, Austria, France, Prussia, Russia, Sardinia, and Turkey; and it has since been adopted by Holland, Belgium, Portugal, Denmark, the Roman States (Italy), and many others, including most of the South American Governments. The United States Government has recognized the doctrine in treaties with various countries. It has been proposed further to limit maritime capture so as to exclude all private property, whether of the enemy or a neutral, except contraband of war. This doctrine is supported by those holding advanced views of international law and by nations possessing a large commerce without adequate naval protection. The great naval powers, like Great Britain, are decidedly opposed to the adoption of a rule which would deprive them of many of the benefits of their offensive maritime strength. It is not probable, therefore, that the rule of absolute exemption from seizure or violation of private property of the enemy at sea will soon be admitted into the law of nations. See CONTRABAND OF WAR. (A. P. S.)

CAPUCHINS (*Ordo Minorum Capuccinorum*) IN AMERICA. The Capuchins are a branch of the Franciscan order, distinguished by great asceticism, and in dress by the hood (*cappuccio, capouche*), whence their popular name. Introduced into France in 1574, and befriended by Cardinal Richelieu, they were chosen as chaplains to the French military posts in North America. They labored in Acadia and the adjacent British possessions, in Brazil, and in the West Indies. In 1642 they had permanent missionary stations on the Kennebec and Penobscot rivers, Me. From 1722, Mississippi, and Louisiana up to its annexation to the United States, were under the almost exclusive religious guidance of the Capuchins. The French Revolution nearly destroyed the order. At present the Capuchins have a seminary at Calvary, Wis., and houses at Calvary, Milwaukee, Pittsburg, Herman, Pa., Utica, Syracuse, N. Y. (2 houses), and Fort Lee, N. J. (J. V. O'C.)

See Vol. V. p. 71 Am. ed. (p. 79 Edin. ed.).

CAPYBARA, a South American quadruped of the family *Hydrochœridæ* and order *Rodentia*; the *Hydrochœrus capybara*, noted as by far the largest existing representative of the order to which it belongs, being some 4 feet long. It has a somewhat hog-like aspect, with a massive body, moderately long limbs, large head, blunt muzzle, long, coarse, scanty hair, small eyes and ears, uncleft muffle, webbed feet, and no tail. The color is dull reddish-brown above, brownish-yellow below. The toes of the fore feet are four, of the hind three, terminating in large hoof-like nails. The skull is massive, with deep zygomatic arches and long paroccipital processes; the palate extends back of the teeth, and the incisive foramina are small; the mandible has a small masseteric ridge; the dental formula is the same as in *Caviidæ*, and indeed nearly all the Hystricine series of rodents (*p. m.* $\frac{1-1}{1-1}$); the upper incisors are sulcate; the molars are remarkably complicated by foldings of the enamel, which divide them into more or fewer transverse lobes cemented together, the back upper molar indeed having twelve narrow plates. The extreme elongation of the back upper molar, and the co-ordinated extension backward of the alveolar portion of the jaw, which is so great that the maxillary bone articulates with the squamosal near the glenoid fossa, are the principal characters of the family *Hydrochœridæ* as distinguished from *Caviidæ*. In habits the capybara is aquatic, frequenting the lakes and rivers of the continent from Guiana to La Plata, and westward into portions of Peru and Bolivia. (See CAVY.) (E. C.)

See Vol. V. p. 72 Am. ed. (p. 80 Edin. ed.).

CARACARA, an American rapacious bird of the family *Falconidæ*, sub-family *Polyborinæ*; the *Polyborus caracara* or *P. tharus* of naturalists. In certain technical characters of the skull and scapular arch this genus is allied closely to the typical falcons; the external characters are more those of the buzzard-hawks, while in its indolent, slovenly, and carrion-feeding habits the caracara resembles the vultures. The beak is long, high, compressed, little hooked, not toothed, with the commissure straight to near the end; the nostrils are peculiar in shape and position, being obliquely linear and opening high in the edge of the cere; the head is extensively denuded and bristly; the shank is long and almost naked. The bird is nearly or about 2 feet long, with the wing about 16 inches, the tail about 10; the color is blackish, more or less extensively and regularly barred with yellowish-white; the tail whitish, with a broad black terminal zone and numerous narrow black bars; the bill and feet yellowish. The caracara inhabits the entire southern border of the United States, and thence extends into Mexico and tropical America: in places where food is abundant, as about slaughter-houses, it sometimes congregates in large numbers. Unlike most hawks, it walks with ease on the ground. The United States bird is generally rated as a variety (*auduboni*) of the South American *P. tharus*. A second and quite distinct species of the genus (*P. lutosus*) inhabits the island of Guadalupe, off the west coast of Mexico. (E. C.)

CARBONDALE, a city of Jackson co., Ill., is on the Illinois Central Railroad, 56 miles N. of Cairo and 125 miles S. E. of St. Louis, on the Illinois Central Railroad, the St. Louis Coal Railroad, and the Grand Tower and Carbondale Railroad. It contains two hotels, two banks, two weekly newspapers, six churches, six schools, and is the seat of Southern Illinois Normal University, founded in 1869. It has three flour-mills, woollen-factory, two machine-shops, and minor industries. It has five parks; its property is valued at $2,500,000, the yearly expenses are $7500, and the public debt is $60,000. It was settled in 1856, and incorporated in 1868 as a city, and no liquor is sold in it. Population, 2213.

CARCANO, Giulio, an Italian poet and novelist, was born at Milan, Aug. 7, 1812, of a patrician family. After preliminary studies at Turin he studied law at the University of Pavia. Before completing his studies he published in 1835 a romance, *Ida della Torre*. In 1839 this was followed by *Angelo Maria*, a touching story of a village-girl, which soon passed through ten editions and was translated into French and German. In the revolution of March, 1848, he took an active part, being secretary of the provisional Government of Lombardy and being sent to Paris on a diplomatic mission. When banished by the Austrian Government in 1849, he retired to Switzerland, and afterwards spent two years in Piedmont. After the war of Italian independence in 1859 he was appointed by the national Government inspector of schools in the province of Milan. He afterwards became a member of the Royal Lombard Institute of Sciences and of the Superior Council of Public Instruction. In 1876 he became a senator of the kingdom. He had continued his literary activity, producing a number of domestic and popular novels, of which the best known is *Damiano*. He has also published three tragedies, two volumes of lyric poems, and a series of biographies of distinguished men. A select edition of his works was published at Florence in four volumes (1861–70). His last romance, which appeared in 1876, *Gabrei e Camilla*, is founded on an episode of the war of independence. In 1843 he began the translation into Italian of Shakespeare's plays, which he has finally accomplished in 1882 in twelve volumes. In it he has observed the most exact fidelity to the original, while the style has been universally praised. His poetry, as well as his other works, is marked by a religious spirit, and he is regarded as a representative of the school of Manzoni.

CARDINAL, or **Cardinal Grosbeak**, a conirostral oscine passerine bird of the family *Fringillidæ*, the *Cardinalis virginianus* of authors, inhabiting more southerly portions of the United States, and noted alike for the beauty of its plumage and the richness of its song. It is also known as the Virginia red-bird and Virginia nightingale—the latter a most misleading term, as there is no bird of the United States which in the least resembles the European nightingale. The cardinal is 8 or 9 inches long; the wing, about 3¾; the tail, 4; the head is adorned with an elegant pointed crest; in the male the general plumage is a bright red, ranging from vermilion to a more rosy tint, obscured with gray on the the back; the face with a black mask; the bill red; the female is brownish, paler and somewhat ochraceous below, but crested like the male, and with more or less red on the crest, wings, tail, and under parts. This bird, of striking appearance and brilliant vocal powers, abounds in the Southern States, becoming less numerous in the Middle, and rarely reaching New England. A variety (*C. v. igneus*) occurs along our Mexican border and thence southward; it is very similar, but the black mask is narrowed or broken on the forehead. Some other species inhabit the warmer parts of America. The Texas or parrot-billed cardinal (*Pyrrholoxia sinuata*) belongs to a different genus, characterized by the very short, stout, tumid bill, with very strongly convex culmen and sinuous commissure; in form and size it resembles the ordinary cardinal, but the bill is whitish: there is no black frontlet; the plumage is ashy-brown, paler below, with crimson or carmine-red in definite areas on the crest, throat, breast, mid-line of belly, and feathers of the wings and tail. All these birds agree closely in their habits, haunting shrubbery, chapparal, or other thick undergrowth, from the heart of which issue their rich rolling notes, while the performers are hid from the view. The nest is built in the thickest bushes, for the most part of intertwined rootlets, bark-strips, and similar materials; the eggs are about four in number, rather elliptical than oval, and very heavily colored all over with brown, gray, and other neutral tints. The birds feed chiefly upon seeds and fruits, like other *Fringillidæ*, and are not migratory. (E. C.)

CAREY, Henry Charles (1793–1879), the greatest of American economists, was born in Philadelphia, Dec. 15, 1793, being the oldest son of Mathew Carey (*vide infra*). His father took especial pains with his education, even training him in the observation and study of economic facts as they walked the streets together. He early developed practical talent; in his ninth year he attended the first trade-sales in New York, where he was called "the little bookseller," and in his twelfth he took charge of the Baltimore branch of his father's firm. In 1812 he served in the militia raised for the defence of Philadelphia. In 1814 he became the second partner in his father's firm, and continued in the business of publishing and bookselling until 1836. In 1828 his firm became Washington Irving's publishers, to that author's express satisfaction, as indeed they were known as the most spirited and energetic house in the trade.

In 1833, Mr. Carey bought a house in Burlington, N. J., where he resided until 1855. On his retirement from the book-business in 1836 he invested a part of his fortune in a paper-mill, in which he sustained heavy losses during the depressing years 1837–40. During his residence in New Jersey he felt, as did the people generally, the oppressions growing out of the monopoly granted to the Camden and Amboy Railroad Co. He was not the man to submit tamely to a corporation which levied toll at its pleasure upon the intercourse between the two chief cities of the country, and which showed the grossest favoritism to the business interests of its directors and stockholders. He began a war of pamphlets, petitions, and newspaper articles which forced the company to a public defence of the manner in which its franchises were exercised, and then to a reform of the worst abuses of its exceptional powers. Mr. Carey thus began that struggle to secure the govermental regulation of the great railroad corporations which still is in progress.

In 1855, Mr. Carey returned to Philadelphia, where he lived as a retired gentleman until his death. His spacious house at Tenth and Walnut Streets, where the "Carey Collection" of pictures and his library of statistical and economic literature were arranged, was the scene of weekly reunions in which the visitor to Philadelphia met with some of the pleasantest and the most characteristic society of the city. Especially during the hospitalities of the Centennial year these gatherings were thronged by distinguished visitors, who cherished his friendship by constant correspondence up to the time of his death. In social intercourse he was brusque but delightful, full of anecdote and reminiscence and of reckless and humorous speeches, exhibiting a raciness and intense individuality, while his inexhaustible kindliness won him the personal regard of all who really knew him. His family circle, in which he was the most tender of husbands and fathers, was broken in 1847 by the death of his wife, the sister of the artist C. R. Leslie.

In 1857, and again in 1859, he visited Europe. On the former visit he warned Mr. George Peabody of the impending panic in America, and Mr. Dallas in Paris of the approach of the Secession movement and the danger to the Union.

Mr. Carey had been a member of the Republican party from its inception, as he recognized the right and duty to oppose constitutional barriers to the spread of slavery. Into the struggle for the Union he entered with his whole heart, animating his fellow-citizens by voice, pen, and personal example to the maintenance of national unity. He was the trusted adviser of both Mr. Lincoln and Mr. Chase, the latter submitting to him the plan for a national banking system, and finding his predictions as to the weak points of the first draft fully confirmed by experience. In politics he continued to take a deep interest to the last. He was a member of the constitutional convention of 1872 which prepared the new constitution for Pennsylvania, and gave valuable aid in shaping its provisions. He opposed the policy of a rapid and wholesale contraction of the national paper currency inaugurated in 1867 by Secretary McCulloch, believing that it would inflict needless and widespread suffering upon classes which had incurred debts during the period of expansion, and would result in the currency of wild monetary plans and theories, especially among the owners of mortgaged farms in the West. When his fears were realized in the rise of the Greenback party, he equally opposed their plan to cancel all bank paper and to substitute Treasury notes, as he believed that the country banks could not exist without their circulation, and that they were of prime importance as local centres of business impulse and facility. He favored the remonetization of silver, and resisted Mr. Sherman's plan for the resumption of specie payments, believing that there was no necessity to make our currency dependent upon our variable and uncertain supply of gold.

For years before his death Mr. Carey had been decaying visibly. He felt keenly the privations and restrictions which accompany old age, although his immediate family and his friends lost no opportunity to lighten the burden. He contracted the illness which resulted fatally in attending a meeting of the Hibernian Society, founded by his father in 1798, and died Oct. 13, 1879. He bequeathed his valuable library to the University of Pennsylvania.

Books and Doctrines.—Mr. Carey began his public career as an economist by an *Essay on the Rate of Wages* (1835), which was mainly a reply to Mr. N. W. Senior's lectures on the same subject. In this he refuted what has been called "the seesaw theory" of wages and profits, then so current among orthodox economists. In 1836 he printed, but did not publish, *The Harmony of Nature, as Exhibited in the Laws which Regulate the Increase of the Population and of the Means of Subsistence, and in the Identity of the Interest of the Sovereign and the Subject, the Landlord and the Tenant, the Capitalist and the Workman, the Planter and the Slave.* A very few copies still exist. In 1837–40 appeared his *Principles of Political Economy*, in three volumes, which was translated into Italian in 1853 and into Swedish in 1853–56. In 1838 appeared *The Credit System in France, Great Britain, and the United States*, which is an ampler treatment of a subject discussed more briefly in the *Principles.* In 1840 he concluded this first group of his writings with a pamphlet on the *Currency.* In all these works he elaborates the principle that there is, in Bishop Butler's phrase, a "constitution and course of nature" in economical matters as elsewhere—that it is a system of harmony and beneficence, expressing to us the benevolence of its divine Author, and exactly adapted to the needs of our human nature. The business of the economist is to learn the laws of the economic order; that of the statesman is simply to remove all obstacles to the free play of those laws. From this he draws the inference that governmental interference in the economic sphere is radically mischievous; that unrestricted commerce between the nations must conduce to the benefit of each and all; that the least restricted banking system—he contrasts Rhode Island with Pennsylvania—is the safest; and that paternal government defeats its own ends. His method throughout is the reverse of that of the orthodox economists; like his father, he always was hungry for facts, and believed that these, and not assumptions, furnished the safe basis for sociological investigation.

With this point in Mr. Carey's teaching some of his European disciples—M. Bastiat, M. Benjamin Rampal, Herr Schulze-Delitzsch, and Prof. Banfield—stop. It was from the *Principles* that M. Bastiat derived not only the doctrines, but most of the arguments and many illustrations, of his *Harmonies économiques* (1850), without acknowledgment of any sort. But Mr. Carey was driven by the hard logic of facts to a further development of his system. When the *Principles* appeared the country was going through the severe depression which economists like his father ascribed to the abandonment of the protective system in 1835. The people at large were satisfied that this view of causes and effects was right, and in 1840 they elected a Whig President pledged to restore the protective tariff. From the tariff of 1842 Mr. Carey expected nothing but a prolongation of the disasters under which he with others had suffered in the preceding years. But he was fairly staggered when he saw the Government credit restored, labor finding employment, capital expanding its ventures in legitimate business, and all those good results achieved which he should have pronounced impossible. He was silenced, and until 1848 he maintained this silence, studying the problem in the new lights of national experience. By 1847 he reached the conclusion that he had under-estimated the number and the force of the hindrances which may arise to the beneficent operation of the laws of economic order. He parted with none of the positive results of his earlier works, but he came to see that in some circumstances the co-ordinating power of Government is needed to secure a harmonious development of national industry by removing the hindrances which more developed communities may find it to their advantage to offer to the industrial growth of the newer and the less developed. In 1848 appeared *The Past, the Present, and the Future*, (Swedish translation by S. J. Callerholm, Stockholm, 1849–51), devoted mainly to a refutation of the assumptions involved in Mr. Ricardo's theory of rent; in 1851, *The Harmony of Interests, Manufacturing and Commercial*, collected from the pages of *The Plow, the Loom, and the Anvil*, to which he frequently contributed. These were followed by *The Slave-Trade, Domestic and Foreign* (1853); *Letters on International Copyright* (1853); *Letters to the President on the Foreign and Domestic Policy of the Union* (1858); and his *System of Social Science*, in three volumes (1858–59; translated into German by Carl Adler, 3 vols., München, 1863–64; 2d ed. 1866; also, Berlin, 1866, and Wien, 1870; abridged by Miss Kate McKean, Phila., 186–, and translated from this abridgment into German and Japanese). This is his *opus magnum*, and may be said to complete the writings of his constructive period, those that followed being occupied with reiteration and defence.

From first to last, Mr. Carey elaborates the principle of his earliest works: that we have to deal with an economic order which exists apart from all our notions and desires; that its laws are always beneficent, but may be thwarted by human wilfulness or stupidity; and that the business of the economist is not to devise but to discover these laws, and that of the statesman not to override but to comply with them. He thus occupies a middle position between optimists like Godwin and pessimists like Malthus and Ricardo, asserting the goodliness of the social order, but admitting the possibility of its defeat. Against Malthus he asserts that the growth of population is self-regulating in every well-governed community, and that its pressure on population characterizes the earlier and not the later stages of society; in this anticipating Herbert Spencer. Against Ricardo he asserts that the whole history of mankind proves a constant progress, not from richer to poorer soils, but the reverse; that the "law of diminished return from the soil" with the increase of labor expended is the direct reverse of the truth; and that the value of land is derived not from the natural and inalienable properties of the soil, but from labor expended, thus anticipating and disproving the agrarian socialism which bases itself upon orthodox doctrines as to land and landownership. Against Hume and Torrens he showed that money plays an active part in the industrial economy; that it is the instrument of association as well as of exchange; that its accumulation at various industrial centres is determined not by demand in the sense of simple need, but by that local development of industrial faculty which makes money more useful at the points to which it tends than at those from which it flows; and that, in the absence of other checks, it will gather into a few great centres of population where its previous accumulation has enabled the most perfect organization of labor. As against the English school generally, he showed that the doctrine of a wage-fund (accepted in his *Principles*) is a delusion resting on no facts; that there is no natural and necessary rate of wages, while there are necessary upper and lower limits to the rise and fall of wages; that the employer finds his interests promoted by high wages more than by low; and that the constant decline in the value of all the accumulations of past labor results in a tendency to equality of condition between labor and capital, the former growing constantly in power to command the services of the latter. For the *price* of a thing is determined by the cost not of its production, but of its reproduction, and with every improvement in method or advance in art, and often by the mere accumulation of products. the cost of reproduction is diminished. Things fall in value, man rises. Closely related to this definition of price are his definitions of *value* and of *wealth*. Recognizing with Ricardo the antithetic relation of the two conceptions, he overcame the perennial difficulty experienced by the English school in fixing the sense of either term. Value he defined as the measure of nature's resistance to our obtaining the objects of our desires; wealth, as the measure of man's victory over nature's resistance. Finally, as against the whole English school and its American representatives, he showed that unrestricted commercial intercourse between nations of different rank in industrial development often results in serious injury to the less advanced by preventing the accumulation of capital, checking the development of a varied industry, destroying the power of industrial associations, and draining the country of its money.

Mr. Carey's vigorous advocacy of these positions soon won for him a foremost place as the representative of the Protectionist party. From 1848 till 1857 he was a constant contributor to the columns of *The Tribune;* but in 1857 Mr. Greeley for a time abandoned the struggle on the passage of the tariff law which still further reduced the duties of the horizontal tariff of 1847. "The whole world has gone over to Free Trade," he said. "If you will wait a little," replied Mr. Carey, "you will see it come back to Protection." Before either gentleman died the greatest of English newspapers spoke of "the wave of Protectionist sentiment which seemed to be sweeping round the world." To the inception and the force of that wave Mr. Carey contributed more than any other man. Before he died he was speaking to the world in eight European and one Asiatic language; he was in correspondence with statesmen, economists, and statists of nearly every European country; and his authority was alleged in the debates of American congresses and European parliaments. (R. E. T.)

CAREY, MATHEW (1760–1839), an American publisher, economist, and philanthropist, was born in Dublin, Jan. 28, 1760, and was the son of a large baker and contractor for the army. He gave no promise of mental force in his youth, and received only a limited education. At the age of fifteen he was apprenticed to a printer and bookseller, at his own desire and in spite of his father's dislike of that calling, and became a voracious reader of such books as came in his way. In 1779 he wrote and announced for publication a pamphlet on *The Urgent Necessity of an Immediate Repeal of the Whole Penal Code against the Roman Catholics.* The title and some daring mottoes on the proposed title-page excited so much indignation that the Roman Catholic committee was alarmed, and offered a reward for the discovery of the author. Young Carey's father procured its suppression as the only means to avoid a prosecution, and sent his son to Paris with letters of introduction to Dr. Franklin, who gave him employment in his printing-office at Passy. After a year he returned to Dublin and got work on *The Freeman's Journal*, and in 1783 started *The Volunteer's Journal* to promote the agitation then going forward for the parliamentary independence of Ireland. He was arrested for libelling the Irish Parliament, and committed to Newgate until the end of the session. Having exhausted his funds, he emigrated in the fall of 1784 to America, landing at Philadelphia. La Fayette, who was then on a visit to this country, interested himself in the young Irish patriot, sent for him to his lodgings, and, besides recommending him to Americans of influence, gave him four hundred dollars to start a newspaper. In January, 1785, Mr. Carey began to publish *The Pennsylvania Herald*, and made a beginning of the practice of reporting the speeches at public meetings and in legislative bodies. A political dispute led to a duel with Col. E. Oswald, in which Mr. Carey was wounded, and was confined to his room for over a year. In October, 1786, he aided in starting *The Columbian Magazine*, both as a partner in publishing and by his contributions, but he soon withdrew, and in January, 1787, he began to publish *The American Museum*, which appeared for six years, and was much superior to any other American magazine. The circulation was fairly large, but the subscription so low that he was constantly embarrassed for money. It was highly commended by Gen. Washington, Dr. Rush, Bishop White, and others. On relinquishing it he began bookselling and publishing on a small scale, and at this he continued until his retirement from business in 1825. In 1792 he married Miss B. Flahavan, who proved a most estimable and useful wife. Of their nine children, six grew to maturity. In 1793 the yellow fever broke out in the city, and raged with fearful violence. Mr. Carey was one of the committee of citizens for the relief of the sick and the care of orphans, and afterward published an account of it which ran through four editions. About the same time he called the meeting which founded the Hibernian Society, to care for the Irish emigrants coming to Philadelphia, and he served as its secretary for many years. In 1796 he helped to establish the Sunday-school Society, under the presidency of Bishop White. The same year he became the object of attack in William Cobbett's *Peter Porcupine's Journal*, and retorted first in *A Plumb Pudding for Peter Porcupine*, and then by *The Porcupiniad, a Hudibrastic Poem.* In 1801 he formed the plan of book-fairs, after a model suggested by the Leipsic *Messe*, and the next year it was adopted at a meeting of booksellers in New York. His own business as a publisher was one of the most extensive and successful in America, and many of the most popular and of the most costly books of this period bear his imprint. In 1806 he began his career as an economist by publishing strictures on the system of taxation pursued in Philadelphia, by which real estate, and especially ground-rents, were taxed to the exemption of personal property. In 1810, although a Democrat, he supported the proposal to renew the charter of the First United States Bank, taking three months from his business to study the subject and illustrate it by his pen; but he received no encouragement from the directors, who even, through a false sense of dignity and delicacy, refused him any information he might need. Besides letters in *The Democratic Press*, he published *Desultory Reflections* and *Nine Letters to Dr. Adam Seybert*, and visited Washington to urge the matter, but without avail. The party in power had little faith in banks of any kind, and much fear of a national institution of this kind. To soften the party asperities which divided Democrats and Federalists, he wrote and published in 1814 his celebrated *Olive Branch*, which passed through ten editions in less than four years, being reprinted in Boston, Middlebury, Vt., and Winchester, Va., with his permission. In March, 1819, appeared his *Vindiciæ Hibernicæ*, designed to vindicate the Irish Catholics from the charges involved in the reports of the rebellion and alleged massacre of 1641—charges then recently reproduced in Godwin's novel, *Mandeville*. Immediately after its appearance he became deeply interested in the causes of the general depression of industry which followed the War of 1812–15, and took part in the organization of the "Philadelphia Society for the Promotion of National Industry." He wrote for the society all but two of the brief "addresses," which, after a wide circulation in tract-form and in the columns of Northern newspapers, were collected into a volume, ran through two editions, and were reprinted in Boston. The other two were by Dr. Samuel Jackson. Another pamphlet from his pen the society refused to adopt as couched in too severe language, so he withdrew in 1820 from its membership, but continued to agitate the matter for thirteen years, in which time he wrote and published more than 2000 pages, making nearly 60 separate publications. The most important of these was *The New Olive Branch, or An Attempt to Establish an Identity of Interest between Agriculture, Manufactures, and Commerce* (1820), of which parts ii., iii., and iv. appeared in 1831–32, and the twelve series of tracts called *Hamilton* (1822–26). The value of his services was acknowledged by Clay, Madison, Adams, De Witt Clinton, and the other Protectionist leaders of that time. Mr. Carey had no selfish interest to serve by a course which cost him money, time, and anxiety without making him any adequate return. He was actuated simply by a passionate patriotism and a conviction that the Free-Trade policy would involve the industrial ruin of his adopted country.

The miseries of the poor and of the laboring classes in Philadelphia moved him to write his *Essays on the Public Charities of Philadelphia* (1828), which vindicate Christian charity from the crude objections of the Malthusians, and have a permanent interest from their glimpses into the social condition of the city. He also supported by pen and purse the policy of the Colonization Society, and advocated a gradual emancipation of the Southern slaves after the fashion adopted in the Northern States. The struggling people of Greece found in him a zealous friend. In 1830 he collected as *Miscellaneous Essays* his accounts of the yellow fever and of the city charities and many shorter papers. His lesser publications are counted by scores. He was an indefatigable pamphleteer, but always for some public end. Without much claim to grace of style, he generally managed to secure the public attention by his frank, dogmatic, incisive presentation of his facts and theories.

He died Sept. 16, 1839, after a brief illness, and was buried in St. Mary's churchyard according to the rites of the Catholic Church, of which he was an intelligent and devout member.

Mr. Carey was a man of less than the average size, and was lame from his youth. But he had a quick eye, a ready tongue, and unlimited social courage, so that he never failed to make an impression on any company. He was a man of pure life, unimpeached integrity, and fervent patriotism; and Philadelphia has had no more public-spirited citizen. (R. E. T.)

CARINATÆ (*i. e.*, *Aves carinatæ*, n. pl.; Lat. *carina*, a keel or keeled vessel), one of the prime divisions of the class of birds, including all existing birds excepting the ostrich and its allies; named from the fact that the sternum develops a keel, which is wanting in the struthious birds, or *Ratitæ* (Lat. *ratis*, a raft). The *Carinatæ* have no teeth; more or fewer of the vertebræ are *heterocœlous*, having saddle-shaped ends of their centrums, and some of the coccygeal ones are fused together into a share-bone or pygostyle, from which the tail-feathers radiate; there is extensive postacetabular ankylosis of pelvic bones; the metacarpal bones are ankylosed together, and the wings are, with rare exceptions, fitted for flight. The carination of the sternum is coordinated with a particular condition of the scapular arch, the scapula and coracoid bones meeting at less than a right angle (with hardly an exception), and clavicles being usually present and complete. In *Ratitæ* the opposite condition of the scapular arch occurs. In all *Carinatæ* also, excepting the tinamous (*Dromæognathæ*), the arrangement of the palatal and pterygoid bones differs notably from the construction of the same parts in *Ratitæ*. Some of the oldest known fossil birds, as *Archæopteryx* and *Ichthyornis*, had keeled breast-bones, but such had teeth, amphicœlous vertebræ, etc., being therefore excluded from *Carinatæ* as here defined. In one of the *Carinatæ*, the ground-parrot (*Stringops habroptilus*), the sternal keel is rudimentary. (See RATITÆ.) (E. C.)

CARLÉN, EMILIE (FLYGARE), a famous Swedish novelist, was born Aug. 8, 1807, in Strömstad, daughter of a merchant, Rutger Schmidt. At the age of twenty she married a physician, A. Flygare, after whose death, in 1833, she spent some years without any permanent residence. During this time she became engaged to a lawyer, R. Dalin, a man of great talent and broad views. He died before they were married, but still, it is claimed, her intellectual development was greatly influenced by him. In 1839 she became domiciled in Stockholm, where she in 1841 married John Gabriel Carlén. Mrs. Carlén was thirty years old when she published anonymously her first romance, *Valdemar Klein* (1838), which evinced literary talent of great power and was received with universal approbation. It was followed by a long series of novels, appearing in rapid succession: *The Representative* (1839); *Gustaf Lindorm* (1839); *The Professor* (1840); *The Foster Brothers* (1840); *The Dedication of Hammarby Church* (1841); *The Rose of Thistleton* (1842); *Chamberlain Lassman* (1842); *The Entail* (1844); *The Fiddler of St. John's Rock* (1846); *The Maiden Castle* (1848); *A Capricious Woman* (1849); *The Tutor* (1851). There was now an interruption of seven years, occasioned by the death of her son, C. W. E. Flygare (1829–1852), who by his translation of some of his mother's sketches into German and by original works had shown decided talent as a scholar and novelist. In 1858, Mrs. Carlén again took up her pen, and wrote, though with less rapidity than before, *The Trading-house* (1860); *Stockholm behind the Scenes* (1864); *The Magic Lantern* (1865); and, finally, *Recollections of Swedish Literary Life, 1840–60* (1878), with which she seems to have closed her industrious career. The complete Swedish edition of her novels is published in 31 volumes. Many of them have been translated into Danish, French, German, and English.

No other Swedish writer has been read so extensively as Mrs. Carlén. Her stories are bright and sparkling, giving evidence also of unusual powers of observation. In recognition of her great services to her country's literature, the Swedish Academy gave her in 1862 its great gold medal. Her literary income has also been large, when we take into account the comparatively small population of her country. Nor has she been ungrateful for the appreciation she has received. She has founded a fund for the benefit of poor fishermen and fishermen's widows, called the "Rutger Schmidt Fund," in honor of her father; a fund for the aid of talented students at the Upsala University, in commemoration of her deceased son; and, in honor of her husband, a fund for poor teachers. Though lacking in deep psychological insight, she has still, by her graphic pictures of everyday life, attained a place among the great romance-writers of this generation.

CARLÉN. JOHAN GABRIEL (1814–1875), a Swedish author, second husband of the preceding, was born in Westgötland, Sweden, July 9, 1814. He studied law, but soon gave up his law practice and devoted himself to literature. Besides some manuals for lawyers, he wrote *Poems* (1838) and *Romances of Swedish Life* (1846). He is also known as the editor of two encyclopædias—*Svenska Familjeboken* (1850–52) and *Läsning vid linsligahärden* (1860). He edited the poetical works of A. M. Lenngren (1857). Bellmann (1856–61), and J. A. Wadman (1869). His *Collected Poems* appeared in 1870. He died in Stockholm, July 6, 1875.

CARLINVILLE, the county-seat of Macoupin co., Ill., is on the Chicago and Alton Railroad, 59 miles N. E. of St. Louis; two other railroads are projected to cross at this point. It is lighted with gas, has two banks, four hotels, two weekly newspapers, eight churches, and graded schools. It has a splendid court-house, erected in 1870 at an expense of $1,500,000. The industries of the town comprise a large foundry and machine-shops, four flour-mills, a woollen-mill, three coal-shafts, and it has over 200 business-firms. Blackburn University, a Presbyterian institution with a theological department, is situated here. The university was founded in 1852 with a liberal endowment, and has an attendance of more than 200 students. Population of Carlinville, 3117.

CARLSON, FREDERIK FERDINAND, a Swedish historian, was born in Upland, June 13, 1811. He received his education in the University of Upsala, where he graduated in 1833, and travelled through Denmark, Germany, Italy, and France, making a long stay in Berlin and in Rome. On his return in 1836 he was made professor of history at Upsala, but was called the next year to Stockholm as tutor to the prince royal. In 1847 he resumed his professorship at the university, which he represented in the Diet for several years. In 1863 he resigned this position to become minister of public instruction and worship at Stockholm. He resigned office in 1870. On May 11, 1875, he was recalled, and retained the post until November, 1878. He is a member of the Academy of Sweden and of the French Academy of Sciences. His principal work is his *History of Sweden*, which appeared both in German and in Swedish (*Sveriges Historia under Konungarne af Pfalziska huset*, Stockholm, 1855–81, 6 vols.). This work, remarkable for the knowledge displayed and the skill in its management, serves as a sequel to the work of Geijer in Heeren and Ukert's *History of the European States*. Carlson has published other works on the history of his country.

CARLYLE, the county-seat of Clinton co., Ill., is on the Kaskaskia River, 47 miles E. of St. Louis, and on the Ohio and Mississippi Railroad. The river is here crossed by a suspension bridge 300 feet long and a railroad bridge 500 feet long. Carlyle has a fine court-house, town-hall, five hotels, two banks, four weekly newspapers, seven churches, a public school and a parochial school. It has four furniture-factories, four wagon-factories, three flour-mills, a grain-elevator, and a saw-mill. Coal is found here, but is not much worked as yet. The town was settled in 1807, and incorporated in 1837. Its property is valued at $1,500,000, and its public debt is $1000. The people are chiefly of American birth, though there are many Germans. Population, 2017.

CARLYLE, THOMAS (1795–1881), the most prominent English writer of the nineteenth century, was born on the 4th of Dec., 1795, at Ecclefechan, a small village in Annandale, Dumfriesshire, Scotland. With this place is also identified in several ways the name of Robert Burns, who died a few months after the birth of Carlyle. Thomas was the first child of the second marriage of James Carlyle, stone-mason and small farmer, known as a man of integrity and much sternness of character—"of all the men I have ever known, quite the remarkablest," writes his son of him. The father of James was remembered as somewhat shiftless and irritable, but in the main honest. James's first wife was a remote cousin; his second, Margaret Aitkin, for whom Carlyle showed strong affection. He speaks of her as "beautiful in all that makes the excellence of woman," and as having "a good deal of wit and originality of mind." Little is known of the Carlyle family back of the second generation, except that it was probably of Cumberland origin, though Carlyle himself, who seems to have had some belief in a pedigree of his own humble branch, traced back ten generations to a Sir John Carlyle, first lord of Torthorwald. From the Rev. John Johnstone, minister of Ecclefechan church, whose son was Carlyle's first teacher, and from his own father, Carlyle, who was a quiet child, received his earliest serious impressions. In 1805 he was sent to school at Annan, where he laid a good foundation in mathematics. It was his father's wish that his son might continue his education to fit for the ministry, and accordingly, in 1809, when nearly fourteen, he set out on foot, with a companion, for Edinburgh University. He complained of the general neglect shown him there as a scholar, one professor at parting from him, his ablest pupil, manifesting "not the slightest sign that I was a person whom he could have distinguished in any crowd." Sir John Leslie, then professor of mathematics, appears to have been his favorite. He soon discovered for himself, what he announced long afterwards, that "the true university of our days is a collection of books." He completed his course in 1814, and while in doubt in regard to becoming a minister began to teach mathematics at Annan until 1816, when he was offered the position of master of the Burgh school at Kirkcaldy, where he found a firm friend in Edward Irving, then teaching there—"the freest, brotherliest, bravest human soul mine ever came in contact with," he wrote after Irving's death. In two years Carlyle had definitely given up the ministry and grown tired of "school-mastering;" so in 1818 he, with Irving, went back to Edinburgh, where he attended law-lectures and secured a few private pupils. He was at that time attacked with the dyspepsia, which lasted all his life. Sir David (then Dr.) Brewster was editing the *Edinburgh Encyclopædia*, and employed Carlyle, who contributed articles on Montaigne, Montesquieu, Nelson, and other topics, sixteen in all, even venturing on so remote a subject as Newfoundland. In 1820 law was abandoned, and his studies in German literature were begun, for he was already meeting refusals for proffered translations of Schiller. He became in 1822 the tutor, at a salary of £200 a year, to Charles Buller, then a boy of fifteen, and to his brothers. By that time he had finished a translation, which Brewster edited, of Legendre's *Elements of Geometry and Trigonometry*, to which he prefixed a paper on Proportion, valued highly by him, although it was begun and finished in a forenoon. The first result of his German studies, a paper on Faust, he furnished in 1821 to the *New Edinburgh Review*. During the two years following he had written the *Life of Schiller* (printed in instalments in the *London Magazine*, and published as a book in 1825), and had translated *Wilhelm Meister*, published in 1824, in which year he followed the Bullers to London, on his first visit to that city. He soon grew dissatisfied with his connection with this family, and in July his engagement with it was terminated.

Irving some years back had been the tutor of Jane Baillie Welsh, daughter of Dr. John Welsh, who claimed to be a direct descendant of John Welsh, minister of Ayr, who had married the daughter of John Knox. Jane Welsh, who was born in 1801, had once been attached to Irving by a feeling much stronger than friendship, but his word, though not his heart, held him fast elsewhere. In 1821, Carlyle first met her, and for some time the disparity of their dispositions made anything beyond friendliness out of the question. But in 1825, the year in which he paid a twelve-days' visit to Paris, both found that they loved, though they were "not *in love*," as Miss Welsh wrote him. The same year he began the translations—"honest journey-work," he called them—known as *German Romance*, published in 1827 in four volumes. Miss Welsh had meanwhile been to see his mother at Hoddam Hill, where the Carlyles were then living. The romantic interference of a third person served to bring their union to a nearer issue, and in Oct., 1826, they were married and went to live at Comely Bank, in the vicinity of Edinburgh. The next year the *Edinburgh Review* accepted his articles on *Richter* and *The State of German Literature*. After much hesitation on her part, his wife and he removed to Craigenputtock ("craig of small hawks"), a dreary moorland farm, an inheritance of the Welshes, situated sixteen miles from Dumfries. Here they lived for six years, and here Carlyle found the sought-for opportunity for uninterrupted thought and work. During these years he contributed a number of articles to reviews, among them the brilliant paper on Burns. *Fraser's Magazine* was started in 1830, the first number containing an article by Carlyle, who remained a contributor throughout his life, though he spoke contemptuously of it as the "mud magazine." Jeffrey, then editor of the *Edinburgh Review*, and in some way related to Mrs. Carlyle, paid a memorable visit, with his wife, to the lonely couple at Craigenputtock. Slight animosities, felt on account of Jeffrey's arbitrary changes in Carlyle's manuscript, were then smoothed away; but there afterwards arose a misunderstanding, of a different nature, which never quite disappeared. John, a younger brother, was then dependent on Carlyle while seeking a livelihood as a doctor in London. This burden and his own discouraging prospects had straitened Carlyle's circumstances, but he refused delicately a kindly offer from Jeffrey of an annuity of £100. Napier soon assumed the editorship of the *Edinburgh Review*, and for a time was friendly, though at last relations with him terminated suddenly. Between January and August, 1831, Carlyle had completed *Sartor Resartus*, which had to wait two years before it saw light, although he went immediately to London to dispose of the finished manuscript, and remained there with his wife during the winter of 1831–32. While there he suffered the loss of his father, who died Jan. 23, 1832. In April the two had returned to Craigenputtock. Goethe, with whom he had been in pleasant correspondence for several years, died in March, and in June appeared Carlyle's only contribution to the *New Monthly Magazine*, an article on "The Death of Goethe." The next winter was passed at Edinburgh. In Aug., 1833, there came to see Carlyle in his lonely retreat the then unknown Emerson, who has described the meeting in his *English Traits*. During 1833–34 *Fraser's Magazine* printed *Sartor Resartus* in instalments, at some risk to the publishers. Emerson, in 1836, edited it as a book in America, but no English edition appeared until 1838. Harriet Martineau, in her *Autobiography*, writes pleasantly of her bringing to Carlyle's house in Cheyne Row, Chelsea, whither he removed permanently in 1834, the proceeds of the sale of a few of the American copies in England. Soon after the removal to No. 5 Cheyne Row, a house built in 1709, the *French Revolution* was begun, and worked silently upon until 1837, with the exception of the publication of a few articles, outgrowths from the larger subject. After the completion of the manuscript of the first volume there befell the author a calamity, the complete destruction of this manuscript. The various stories of this catastrophe differ so that it is hardly safe to say more than that it happened at the house of Mrs. Helen Taylor, afterwards the wife of John Stuart Mill, who had carried the papers there, and that these were probably used by some servant for lighting a fire. The work was at last made complete again, and the *French Revolution* appeared in 1837 in three volumes. Mill had the pleasure of promoting its immediate popularity by a friendly notice in the *Westminster Review*. John Sterling, too, in 1839 wrote in that review to the same end. A second edition appeared in 1839, containing an important and amusing correction of the totally false account of the sinking of the ship Vengeur in book v. chap. vi.

In 1837, Carlyle, who was not altogether unfitted for the demands of oratory, began a course of six lectures on "German Literature." The next year twelve lectures followed on the "History of Literature;" and in 1839 six lectures, with increased attendance, were given on "The Revolutions of Modern Europe." In 1840 six lectures on "Heroes and Hero-Worship" were delivered, and were the only ones published, appearing the next year in book-form, and gaining a popularity greater than any other of his works thus far. The first collected edition of his *Critical and Miscellaneous Essays*, in four volumes, appeared in 1839, containing nearly all his contributions to periodical literature since 1827. A second edition, in five volumes, was needed the next year, when also appeared two editions of his political tract *Chartism*. Fraser in 1841 republished Emerson's *Essays*, and Carlyle furnished a preface, recommending his friend to the "small thinking public." In 1844 he wrote a shorter preface to a second edition of these *Essays*.

While gathering materials for *Oliver Cromwell's Letters and Speeches* he published *Past and Present*, which furnished the basis of an article by Mazzini in the *British and Foreign Review* for Oct., 1843, on the "Genius and Tendency of Carlyle's Writings." In 1844 the shameless opening of Mazzini's private letters caused Carlyle's hearty indignation, though neither he nor his wife had political sympathy with the Italian patriot. Two volumes of *Cromwell* appeared in 1845, followed in 1846 by a supplementary volume. In the latter year Margaret Fuller, who then first saw him at his home, says: "He seems to me quite isolated—lonely as the desert. . . . He sings rather than talks. He pours upon you a kind of satirical, heroical, critical poem, with regular cadences." He edited and published in *Fraser's Magazine* for Dec., 1847, the *Squire Papers*, under the title of "Thirty-five Unpublished Letters of Oliver Cromwell," which form an appendix to later editions of *Cromwell*. The authenticity of these letters was foolishly questioned at the time. Emerson, who was lecturing in England in 1848, describes Carlyle as then "grown so fierce and savage that he should be afraid of trusting some of his more gentle and spiritually-minded friends in his presence." The friendship of Carlyle and Emerson indeed, about that time and for some time after, seems to have undergone something of a shock; but their *Correspondence* (2 vols., 1883) leaves no doubt as to the real depth of their mutual esteem of each other's spiritual worth.

The Revolution of 1848 and the terrible Irish famine were the subjects of a few of his rare contributions to journalism; and the year 1849 found him in Ireland in company with Mr. (now Sir) Charles Gavan Duffy. His journal of that trip was published by J. A. Froude in 1882. In November of 1848 the brilliant radical Charles Buller died, and a touching tribute was paid him in *The Examiner* by his old tutor and friend.

The Royal Commission appointed in 1849 to inquire into the constitution and management of the British Museum summoned Carlyle to testify. His outspoken opinions had their effect, though what he said cost him dearly in prejudicing against him Sir Anthony Panizzi, then Principal librarian. The preparation of *Cromwell*, and, earlier, of the *French Revolution*, had made it necessary for him to have access to much material, practically rubbish, but essential to his purpose. He found the British Museum quite inadequate to his needs, and did not hesitate to say so; but characteristically declined to be explicit as to better methods.

The sobering effect of the Revolution of 1848 upon that remnant of radicalism still left in Carlyle was seen in the now definite conservatism of those political articles—beginning in *Fraser's Magazine* for Dec., 1849, with the *Occasional Discourse on the Negro Question*, and continued from January to July, 1850—which form the notorious *Latter-Day Pamphlets*. After these scathing tracts on contemporary affairs it was natural that in 1851 (Crystal-Palace year) he refused to be present at the Peace Congress in London. This year the *Life of John Sterling* was published. As the *Latter-Day Pamphlets* were intended for an unqualified condemnation of the drift of politics, so Carlyle meant to make the *Life of Sterling* the vehicle for delivering his opinions on religion, more particularly on the condition of the Established Church of England. The undertaking in itself was a criticism, if not a censure, upon the sketch by Archdeacon Hare prefaced to his edition, in two volumes, of Sterling's *Essays and Tales*, published in 1848. Hare's is the shorter, the more direct, and, in the opinion of some who knew Sterling best—among them, lately, Miss Caroline Fox—the one to be preferred of the two lives. There is little of a discursive nature in Hare's sketch, except towards the close, when he takes occasion to speak plainly, as a Churchman, about Sterling's final attitude of dissent from the Church. Carlyle, however, seems to have chosen the life of his friend as a text for a discourse upon the religious phases of the time. Sterling, as both biographers show, passed from an early radicalism, which was exploded suddenly by the immediate cause of the tragic end of some Spanish refugees who had enlisted his sympathy, to a gradually strengthened belief that the old Church, though seemingly inert, might be quickened by the infusion of a new and warmer spirit. To this position he had been brought, in a large measure, by a personal acquaintance with, and tutelage in, the philosophy of Coleridge, the sketch of whom in the eighth chapter of Carlyle's book is memorably vivid. This "thrice-refined pabulum of transcendental moonshine," to use Carlyle's words, had the effect, after the fever of radicalism had passed off, of determining Sterling to connect himself actively, in the office of deacon only, with the work of a curacy, under the guidance of Hare. In a few months he became convinced that active service in the Church in following his chosen model, the apostle Paul, was not the path for him; accordingly, pleading ill health as the cause, he withdrew from the curacy, and henceforth, with gradually increasing bodily infirmity, applied himself to literature bravely, but with little popular encouragement, until his death in the thirty-ninth year of his age. Sterling was a bright, impetuous thinker and worker. "Overhaste was his continual fault," says Carlyle of him; and yet in the matter of his religious estrangement Carlyle makes out his passage over the sea of religious doubt a more stormy one than it, in all probability, really was, though he is careful to insist upon Sterling's essentially pious nature; yet piety, he thinks, was not the "principle deepest in him." In his desire to show that holding aloof from participation in religious questions was the only position possible in his times for so candid a mind as Sterling's, may be seen perhaps a vindication of Carlyle's own attitude. Certainly no other of his writings comes so near to a discussion of those themes on which he generally chose to be silent.

Carlyle in 1852 visited Germany for the first time to examine some points in the life of his chosen hero, Frederick the Great. He returned in November, to begin in earnest the immense task of writing his most elaborate historical work. Finding himself baffled in an attempt to secure special privileges at the British Museum, he was obliged not only to find, but to buy, the needed books and pamphlets. On Christmas Day of 1853, Carlyle was with his mother when she died, at the age of eighty-three. The next few years, until the appearance of the first collected edition of his works in 1857–58 in sixteen volumes, saw little interruption in his studies, except a paper in the *Westminster Review* for Jan., 1855, *The Prinzenraub: a Glimpse of Saxon History*. It was intended that *Frederick* should be complete in four volumes, but it was barely compressed into six, the first two of which appeared in 1858. The next two years were spent quietly, varied by a visit in 1859, with his wife, to Fifeshire and Aberdour, and one in 1860 to Thuro Castle, the home of Sir George Sinclair. The third volume of *Frederick* appeared in 1862. He was then sixty-seven years old, and one who saw him at that time speaks of him thus: "Carlyle's long, wild gray hair hangs over his forehead. His eye is bright and lively, his complexion healthy, and his look generally betokens a man who leads a calm life. His wife told me she took in the *Daily Telegraph* in order to know what was going on in the world. Her husband never reads the papers." This habit of not reading the current news, though he used to look at *Public Opinion*, which was sent him, did not prevent his forming strong opinions of passing events. His feelings in regard to the Civil War in the United States are amply expressed in his *Ilias (Americana) in Nuce*, in *Macmillan's Magazine* for Aug., 1863. He did, in a slight measure, afterwards retract somewhat of his bitterness on this subject, which went so far as almost to induce him to write a pamphlet in support of "poor Davis." The fourth volume of *Frederick* came out in 1864, and the fifth and sixth in 1865. The next year Carlyle made his last great public achievement and passed through his greatest sorrow.

Mr. Gladstone had just retired from the office of Lord Rector of Edinburgh University, and in 1866 Carlyle was chosen to that office over Disraeli by the expressive vote of 657 to 310. On the 2d of April, 1866, in presence of a great audience, the new rector, after formal introduction to Sir David Brewster, who so many years before had found in him a faithful contributor to his *Encyclopædia*, began that famous *Address*, speaking without aid of manuscript. There is perhaps no better account of the occasion than that by Mr. Moncure D. Conway, as told in his *Thomas Carlyle*, published in 1881. On April 21, Carlyle being then away from home, Mrs. Carlyle, while taking her usual afternoon drive, died suddenly. She was buried with her kindred in Haddington. It was soon after, under the pressure of grief and remorseful fear that he had in her lifetime refused to see her worth, that Carlyle gave expression to the chapter upon his wife in his *Reminiscences*. To his own self-condemnations must be added the ample evidence in Mrs. Carlyle's *Letters and Memorials* that there were dreary passages in their wedded lives into which it is not decorous or profitable to inquire too deeply.

Shortly after this loss Carlyle became interested in supporting the side of Gov. Eyre in connection with the troubles in Jamaica, and accepted the position of the vice-president of the fund for the defence of the ex-governor against the charge of complicity in a massacre. In Aug., 1867, *Macmillan's Magazine* printed his *Shooting Niagara: and After?*—which has probably given more offence than any other of his writings. Some relief to his weary condition was found in revising the Library edition of his works between 1868 and 1871. Though withdrawn largely from public affairs, he expressed himself warmly on the side of Germany in the Franco-German War. In 1872 he superintended the cheap "People's Edition" of his works. *Fraser's Magazine* in 1875 contained his *Early Kings of Norway* and *The Portraits of John Knox*, his last effort. His eightieth birthday was made an occasion for presenting him with a gold medal executed in his honor by Boehm, whose statue of Carlyle has been commended by Ruskin. Once in 1876, and for the last time in 1877, in the columns of *The Times*, he made himself heard, taking the part of Russia, then in war with Turkey. At last, not suddenly, but from long-continued weakness, he died, very quietly, on Feb. 5, 1881, in his eighty-sixth year. He was buried, not by the side of his wife, but with his father and mother at Ecclefechan.

Among other items of bequest, he left the books collected during the preparation of *Cromwell* and *Frederick* to Harvard University, from which in 1875 he had accepted the degree of LL.D., an honor he once refused from Edinburgh University. He refused also the grand cross of the Order of the Bath, offered by the Earl of Beaconsfield to him and Tennyson; he, however, received the chapter of the Civil class of the Prussian Royal Order "for merit," left open by the death of Manzoni—a distinction of more significance to him. There are of course several good portraits of him, one of the most accurate being taken from Boehm's statue, to be found in the (London) *Art Journal* for 1878.

In giving advice on literary matters it was Carlyle's wont to discourage the development of the poetic faculty. Conscious that the few serious attempts he made to construct verses were efforts at best, he confined himself to prose, and advised others to do the same. And yet his "Faust's Curse," from Goethe, and the "Sower's Song," are correct and pleasing, if nothing more. All his poetic feeling came out with more fulness in his prose. The first thing Carlyle ever wrote for publication, curiously enough, was fiction, a little story, *Cruthers and Jonson*, first printed in *Fraser's Magazine* for Jan., 1831. Of the *Edinburgh-Encyclopædia* articles Lowell says: "Carlyle in these first essays already shows the influence of his master Goethe." They are noticeable for soundness, even maturity, of judgment. The *Life of Schiller*, to which in 1872 was added an appendix, more important now than the original work, is faithful and direct, but somewhat ornate and formal; Goethe, however, in a letter to Carlyle praised it, and wrote a preface to the German translation.

Of all his contributions to magazines and his minor writings, gathered up afterwards, with few exceptions, into his *Critical and Miscellaneous Essays*, it is not possible to speak adequately. For the most part, they are fragmentary results of his German studies, many of them portions of a never-published *History of German Literature*, or offshoots thrown out while writing his larger works. A few others, like the splendid paper on Burns, the *Signs of the Times*, and *Characteristics*, take rank with his more extended writings.

Sartor Resartus, the product of his lonely and embarrassed life at Craigenputtock, is now known to be autobiographical in many incidents, and is the first utterance of his own beliefs, distinct enough if looked at closely. Sterling maintained that its tendency was pantheistic; but this is true only in that it holds that the universe is pervaded and formed by the Spirit of God. The earliest strong protest of this century against materialism, it embraces some of the essential points of Kantian transcendentalism. Creeds, systems, are all phenomena, not real in themselves; when no longer of use to be discarded, like worn-out clothes. "Truth," cries the hero, Teufelsdröckh, "though the heavens crush me for following her—no falsehood!" Teufelsdröckh has got no farther than doubt and despair when he has to decide (and this is autobiographical) between the "everlasting No"—continuance in intellectual fear—and the "everlasting Yea," which is "Love not pleasure—love God." This is similar to Goethe's utterance that "it is only with renunciation that life, properly speaking, can be said to begin." After chosing the everlasting Yea he can view with composure, though with sadness, the follies of the clothes-philosophy. One of the many passages of rare beauty is that where Teufelsdröckh sits in his lonely student-room brooding over the sleeping city beneath.

The *French Revolution* is properly an epic of the "destructive wrath of Sansculottism," "chanted," as Victor Cherbuliez says, "on his lyre, to which, for the occasion, he added a brazen string which made its tones truly diabolic." Carlyle is still carrying out in it the theory of *Sartor Resartus*. France was done with the ancient régime; Sansculottism rises, "many-headed, fire-breathing, and asks, What think ye of *me?*" But that too went down, because "it sought a lubberland of happiness, benevolence, and vice cured of its deformity." Carlyle, though his humor—and it abounds here—is at times bitter, has not lost pity and love for humanity, and is on the side of the Sansculottes, but only as they were less of a sham than kings, nobles, and priesthood. Descriptive power never went farther than his pictures of the procession of the States-General or of the taking of the Bastille. Montégut, writing in the *Revue des Deux Mondes*, says: "I prefer his history of the French Revolution to all those we have ourselves produced; I find it as dramatic, and, I will venture to say, more profound."

Of the four courses of lectures ("detestable mixture of prophecy and play-actorism," Carlyle afterwards called them) delivered between 1837 and 1840, there is unfortunately but one published, *Heroes and Hero-Worship*. Much cheerfulness and hope is still to be found in them. Progress, Liberty, Friends of the Species, were terms that did not evoke the contemptuous abuse of ten years later. It is congenial reading for those who wish to think of Carlyle as a hero, as a man of letters. *Chartism*, too, destined to be in a measure forgotten from the passing nature of its theme, takes a compassionate view of the destiny of oppressed classes, for whom he saw hopes of amelioration by the perfection of mechanical aids to labor. He did not believe in universal suffrage, the "count of heads and clack of tongues" of later years, but was then and always an advocate of popular education and of plans for emigration. He too, had England rejected his *French Revolution*, was ready to "buy a rifle and spade and withdraw to the Transatlantic wilderness, far from human beggaries and basenesses." He had already concluded that mankind needed not the power of deciding what is best for itself, but fit men—heroes—to decide for it. His later doctrine in its unlovely completeness was not proclaimed. This need of fit men he turns to account in *Past and Present* by a practical lesson having for a text the character of Samson, abbot of St. Edmundsbury, Suffolk, in the twelfth century, a life of whom was given in a chronicle written in Latin by Jocelin de Brakelond, edited for the Camden Society.

The rescue of the fame of Cromwell from oblivion, certainly from obloquy, by Carlyle's *Oliver Cromwell's Letters and Speeches*, will ever remain a remarkable literary "success." Hume's strangely false prophecy that "the collection of all his (Cromwell's) speeches, letters, sermons, would make a great curiosity, and, with a few exceptions, might justly pass for one of the most nonsensical books in the world," is an instance of how the man was misunderstood. Cromwell's present position in English history is due, we must conclude, not only to the genius of Carlyle, but to the enormous amount of drudgery he bestowed upon his subject. Hero-worship is now fully enunciated. There must be self-abasement of the multitude before its leader, in whom must be palliated or ignored all the foibles censurable in common man. "He is thy born king, thy conqueror and supreme lawgiver. . . . The stars, keen-glancing from the immensities, send tidings to him." It is the weak who are to bear the infirmities of the strong; and the outcome is pure despotism. One result of this worship is the half-contempt in which Carlyle held men of great but not supreme ability. Hampden, Pym, the patriot Vane, are underrated. Lacking himself that repose often associated with great souls, which Goethe had in its perfection, Carlyle neglected to do justice to the men of a quieter sort. Washington, La Fayette, Lincoln, never attracted him as did stormy Mirabeau or coarse Frederick.

The Revolution of 1848 deepened Carlyle's faith in the worth and stern necessity of Puritanism, and his belief that things were gone wrong is made manifest in *Latter-Day Pamphlets.* With the wildest mannerisms of his style unrepressed, discarding all tenderness, his humor grown coarse, he lays about him thick and fast, aiming a blow wherever the rising democratic spirit shows its head. "Model Prisons" is as violent as any of these "Tracts for the Times." It vituperates, of course, the memory of John Howard and the results of his life. Carlyle goes to a prison and sees the "diabolical canaille" ("rotten, multitudinous canaille," he finds them later); they are roofed in, fed, and held fast; that is not enough for him; he wants for them "a collar round the neck and a cart-whip over the back."

What these *Pamphlets* were to politics the *Life of John Sterling* was to Christianity. We have in it Carlyle's most definite views of religion and literature. Sterling was first a radical, then became a curate—"went about among the poor, the ignorant, and those that had need of help," says Hare, his other biographer; then turned finally to literature, where, it is now admitted, he did little remarkable. He had pointed out in *Sartor Resartus* Carlyle's lack of sympathy with "the great body of those who are now endeavoring to guide and help onward their fellow-men;" but, soon won by the creed of hero-worship as thus far laid down, he seems to have thought of Carlyle, what Taine keenly says was Carlyle's own opinion, that he was "a great man misunderstood, of the race of heroes—that the human race ought advisedly to trust itself in his hands." Though there is in general a more subdued and even temper in this work, Carlyle at times bursts out in unmeasured scorn against the Christian ministry with such epithets as "black dragoons," "poor devils, shamming, and endeavoring not to sham." Contemptuous, too, is the vivid sketch of Coleridge, in which is ridiculed the very philosophy laid down, in some particulars, in *Sartor Resartus.*

The third and last great historical work, the *History of Friedrich II. of Prussia, called Frederick the Great,* was begun when Carlyle was fifty-eight. He says: "*Cromwell* was by much the worst book-time till this of *Friedrich,* which, indeed, was infinitely worse; . . . lasted for about thirteen years." It covers much more than the period of Frederick alone, and includes a history of the intricate connections of the Hohenzollerns with European politics. It has been the most severely handled of his works, except perhaps the *Latter-Day Pamphlets.* Few have been ready to accept the "veracity" of Frederick's father, Frederick I., in face of the lies he told. The judgment of history has not ratified Carlyle's approval of the seizure of Silesia from Maria Theresa of Austria, nor the subversion of the Pragmatic Sanction, by Frederick. Though the descriptions of the Tobacco Parliament, the battle of Hohenfriedberg, and the all-important study of Voltaire's relations with the Prussian court, show that little of Carlyle's literary dexterity was gone, still, the wild extravagance of style, the extreme conclusions of hero-worship, and the author's apparent loss of faith in his undertaking, tend to place *Frederick* below his other great efforts. Carlyle wrote two years after finishing it: "It is now become insignificant as the dung of a thousand years ago. I did get through, thank God; let it now wander into the belly of oblivion for ever."

As to his Lord Rector's address, his own words are comment enough: "No idea, or shadow of an idea, is in that address but what has been set forth by me tens of times before, and the gaping sea of Prurient Blockheadism receives it as a kind of inspired revelation."

Besides *Shooting Niagara: and After?* and *Portraits of John Knox,* there was one more book, *Early Kings of Norway,* said to have been written earlier in life, but the publication of which showed, in general opinion, that Carlyle was then (1875) a very old man.

In a touching passage of the *Reminiscences* of his wife there is an expression of Carlyle's own feeling in regard to the fate of his books: "No daughter or son of hers was to sit there; so it had been appointed to us, my darling. I have no book a thousandth part so beautiful as thou; but these were our only 'children'—and, in a true sense, these were verily ours; and will live perhaps some time in the world after we are both gone; and be of no damage to the poor brute chaos of a world, let us hope!"

The same charitable complaisance shown toward the failings of men of genius may in time be extended to the reputation of Carlyle; but at present those who still smart under his castigations cannot be said to be in a condoning mood. Hard but wholesome rebukes of existing shams, and forebodings of a speedy doom for institutions founded on unstable foundations, put Carlyle in the position at once of teacher and prophet. People are willing enough to listen to any strong voice which calls them away from the sordid cares of daily life and warns or exhorts them to higher efforts, yet they are by no means ready to obey injunctions other than those that cheer them onward in some self-chosen path. But when the teacher who would instruct has lost faith in even the intelligence of his disciples, his lessons are in danger not only of not being laid to heart, but of not being listened to. Had Carlyle died after he had written *Past and Present,* he would have been remembered as one who sought to dissuade men from the hollowness of metaphysical speculation on the one hand, and from the growing materialism of the present century on the other. Followers—the young for the most part, and those whose lot is at best a hard one—would have taken courage at his biddings to do the allotted work of life bravely and silently. It was a sad but not dispiriting creed. He lived, however, to write the *Latter-Day Pamphlets* and *Frederick the Great;* and it is most certain he did not carry men's opinions with him. He added article after article to the dogma of hero-worship, until he finally came to disbelieve even in constitutional government. No amplified demonstration is wanted to show that the tendency of the times has been in another direction. Men turn away from him, as they turn from Kingsley and Ruskin, after first extracting what they think to be of real worth in what he said. Carlyle is by no means the only one of this age who has held that things never can be righted, but will grow worse until mankind submits itself to the immutable laws of the universe. He, however, in pointing, as he advanced, with the eagerness of a seer to the immensities and eternities, naturally stumbled over the problems of an every-day life which must be lived; and these problems he dashed aside with impatience. It was this characteristic impatience of methods which made him so scornful toward men like Bentham and Howard with their schemes of political regeneration or of philanthropy. Others, perhaps as anxious as he that eternal verities may prevail, cannot embrace that large optimism which made human slavery seem right in his eyes, because, as he thought, natural laws declared for it. There was also an immense deal of that Jesuitism for which he professed especial abhorrence in a creed which held that force, even brute force, might use monstrous means to gain ends to him holy.

Whoever looks at his life to find consistency begins a useless task, for there is in his nearly twoscore of volumes one grand inconsistency with his continual plea for silence. It is difficult, too, to make some of the facts of his private life stand the test of his lofty standard of truth and "veracity." After the fullest allowance that he was a man of genius tormented with dyspepsia (though Froude intimates that this trouble was exaggerated), and inheriting, from the circumstances of his origin, a suspicious aggressiveness towards others of gentler bearing, his manner of treating many who came in contact with him was open to the charge of being double-faced, because he received those as friends of whom he wrote, in secret, sentiments which, if suspected by them, would have speedily terminated all possibility of further acquaintance. Charles Lamb, who was a visitor at his home, he wrote down a "pitiful, rickety, gasping, staggering tomfool." There is more than a suspicion of insincerity in this confounding a man's moral weakness with physical infirmities not to be helped, in a sentence meant for posthumous publication, and not excusable in either a dyspeptic or a genius.

While there is perhaps not a person who has not gained strength by the mere reading of Carlyle's robust writings, it is safe to assert he has no prominent follower of his doctrines at present, nor is he likely ever to have, unless his prophecies come true. He taught the possibility of taking a broad view of men rather than a too searching inspection into their private conduct or their particular creed. Profiting by this example in his own case, some disregard may well be shown to the eccentricities and inconsistencies of a character of unassailable purity. As he was the most prominent English man of letters of this century, it is probable that there is to be an inquiry, already well begun, into his life and character not seen since the death of Dr. Johnson. Leaving out of the question the value of his writings, it is worth while, in forming an opinion of the man himself, to bear in mind Emerson's suggestion to him, that he ought to have inscribed upon the doorplate of his house the word "Whim," that people might know who lived there. (LL. S.)

CARMI, the county-seat of White co., Ill., is on the W. bank of the Little Wabash River, at the junction of the St. Louis division of the Louisville and Nashville and Wabash, St. Louis, and Pacific Railroads, 123 miles S. E. of St. Louis. It has a bank, three weekly newspapers (one German), one normal school and commercial college, public schools, five churches, three flour-mills, planing-mill, stave-and-barrel factory, machine-shops, and a foundry. It has slack-water navigation, and the water-power is used in woollen manufactures. Population, 2512.

CARNOT, Lazare Hippolyte, a French statesman and author, a son of the famous war-minister, was born at Saint-Omer, April 6, 1801. He accompanied his father in exile in 1815, and passed seven years at Magdeburg. He returned to France in 1823, studied law, and became a moderate follower of Saint-Simon. He was elected to the Chamber of Deputies in 1839, 1842, and 1846, and was minister of public instruction from February to July 5, 1848. In this position he instituted public lectures for the people, improved the condition of teachers, and introduced the study of rural economy in primary schools. In 1848 he was elected a member of the Constituent Assembly for the department of Seine. After the *coup-d'état* of Dec. 2. 1851, Carnot was elected to the Corps Législatif by the voters of Paris, but he refused to take the oath and retired to private life. In 1863 he was again elected, and took his seat, but in the election of 1869 he was defeated by Gambetta. In February, 1871, he was elected to the National Assembly, in which he voted with the Republican Left. He was chosen a senator for life in December, 1875. Among his works are *Exposé de la Doctrine Saint-Simonienne* (1830); *Des devoirs civiques des Militaires* (1838); *Mémoires de Bertrand Barère*, with David d'Angers (4 vols., 1842–43); *Mémoires sur Carnot par son Fils* (1861–64); and *Lazare Hoche* (1874).

CARO, Elme-Marie, a French philosopher and author, was born March 4, 1826, at Poitiers, where his father was professor of philosophy. He is descended from an old Breton family of Morbihan. He studied in Paris at the Collège Stanislas from 1839 to 1845, and obtained the prize in philosophy at the general competition of the colleges of Paris. He then passed to the École Normale, where he completed his studies in 1848. After teaching and lecturing in the lyceums of Angers, Rouen, and other cities, he became professor of philosophy at Douai, and in 1858 was called to the École Normale of Paris as master of the conferences of philosophy. In 1864 he was chosen to the professorship of philosophy in the University of the Sorbonne, and in 1869 was made a member of the Academy of Moral and Political Sciences. In 1873 he was admitted to the French Academy, and in 1877 was made an officer of the Legion of Honor. In the early part of his career he published an essay on *Saint Dominique et les Dominicains*, and later a sketch of the theosophist Saint-Martin (1854). Several of his contributions to reviews were collected under the title *Études morales sur le Temps present* (1855), and the work was crowned by the French Academy. He has since published *Nouvelles Études* (1875), *Les Jours d'Épreuve, 1870–71* (1872), *La Fin du 18me Siècle*, which discusses also the philosophy of that time, and thus forms a connecting link with his philosophical works. The principal of these are—*L'Idée de Dieu et ses nouveaux Critiques* (1864; 6th ed. 1878); *Le Matérialisme et la Science* (1868), in which he opposes the idea that materialism is a necessary result of scientific study; *Les Problèmes de Morale sociale* (1876); *Le Pessimisme au 19me Siècle* (1878). His last work, published in the *Revue des Deux Mondes* in 1882, is an exposition and refutation of the Positive philosophy, under the title of *M. Littré et la Positivisme*. During the sixteen years of his professorship at the Sorbonne he discussed all the problems of modern philosophy, maintaining with great ability the existence of soul and spirit against Positivism as well as against scientific materialism. His idealism, his love of poetry as well as of the deepest problems of metaphysics, and his profound reverence for Christianity, may be partly attributed to his Breton origin. To the simple faith which characterizes the natives of that region he joins the acuteness and learning of the mediæval philosophers. His style is clear and brilliant, rendering his discussions of philosophy attractive even to general readers. In contrast with most of the contemporary French critics, he gives prominence to the ethical aspects of literary questions.

CAROB TREE, Algaroba, Locust Tree, and St. John's Bread (Arabic, *Kharrûb*, a carob), names applied primarily to an Old-World leguminous tree having a wide geographical range. The carob tree, or Old-World algaroba, as generally understood, is *Ceratonia Siliqua;* the South American algaroba, *Prosopis dulcis;* the Chilian algaroba, *Prosopis siliquastrum;* the Texan algaroba, *Prosopis glandulosa;* while a species which by its husks and seeds furnishes the Chilians with a famous tannin material is *Prosopis pallida*. The name *Siliqua*, which means simply "pod," Pliny applies without qualification to the carob, and hence the modern botanical term.

The fruit is frequently sold in the larger cities of the United States under the names of carob and St. John's bread, being imported from the Mediterranean. The great number of exhibits from Europe in which the carob appeared at the United States Centennial Exhibition in Philadelphia proved the importance attached to it in the Old World. The usual length of the dark-brown pods is about six inches, and they are about a quarter of an inch thick, but some on exhibition were ten inches long and of a proportionate thickness. These improved varieties are propagated by grafting, the art of doing which, and indeed the whole culture of the tree, is the subject of a goodly-sized French work, *Du Caroubier et de Caroube*, by Bonzom, Delamotte, and Rivière, published in Paris in 1878. As a general rule, the culture is left to nature, and especially so in the dryer or almost desert regions of the south of Europe and the north of Africa, where the tree seems to delight to grow. In Syria and Egypt especially the fruit is superior, and though carobs from most of the other parts of Europe are chiefly used as food for horses, sheep, and swine, those from these countries are esteemed excellent human food. In the ruins of Pompeii some carob-pods were found in the food-closets.

Improved varieties are planted largely by the French in Algeria at the present time. The ancient Hebrews made a preserve by boiling the pod with sugar; the refuse made excellent food for swine, and this is supposed to be the "husks" referred to in the story of the Prodigal Son, though from the derivation of the name there seems to be no reason why the whole fruit or pod might not have been intended. The trees, however, appear to have been wild and abundant, and there should have been no difficulty in obtaining them. Some modern commentators, having no knowledge that the locust insect was eaten by the ancients, supposed this tree must be the locust on which John fed when in the wilderness, and that the "honey" was also the product of this tree. This is the origin of the name St. John's bread. But the food of the prophet was undoubtedly the insect, and the honey that furnished by bees. The tree is not distantly related to the *Gleditschia triacanthos* of the United States, the "honey locust," to which it has furnished the common name. It makes a beautiful round-headed tree, with glossy, somewhat glaucous and evergreen foliage, but it will not endure the frost. It might be valuable for planting in the dryer regions of the American continent.

CARPENTER, MARY (1807–1877), an English philanthropist, was born at Exeter, England, April 3, 1807. Her father, Rev. Dr. Lant Carpenter, was the pastor of a Unitarian congregation there, but in 1817 he removed to Bristol. Besides his pastoral duties he had a small school of boys, and Mary was educated with them. She early manifested an earnest religious spirit. When, in 1829, her father was compelled to relinquish his school, she and her sister Anna opened a school for girls. The famous Brahman, Rajah Rammohun Roy, who had renounced idolatry, came to England in 1833, and died at Bristol. The interest excited by this remarkable man was shown in later years by her narrative of the *Last Days of Rammohun Roy* (1866). Another visitor, Rev. Joseph Tuckerman of Boston, was the means of directing her to her work in life. Under his influence, in 1835 she founded a working and visiting society, by which much was done to improve the condition of the poor. After the death of her father in 1839 she continued her school and charitable work, and in 1845 published a little devotional work called *Morning and Evening Meditations for Every Day in the Month.* This passed through several editions in England and America. Through Unitarian friends in Boston she was led to take an interest in the efforts for the abolition of slavery in America, and many distinguished leaders of that cause visited her. In 1846 she began her special work for destitute children by opening a ragged school in Bristol, which was successful from the start. Two years later she gave up home-teaching, and thus had time to prepare a *Life of Rev. Dr. Tuckerman* (1848), which was soon followed by *Ragged Schools, their Principles and Modes of Operation* (1849). Looking still farther into the needs of her country, she published in 1851 *Reformatory Schools for the Children of the Perishing and Dangerous Classes and for Juvenile Offenders*, in which she urged the necessity not only of reformatory schools, but also of good free day-schools, of industrial schools, and compulsory attendance. A conference was held Dec. 10, 1851, to help this movement, and a parliamentary committee of inquiry into juvenile delinquency was appointed. To give a practical example of what was needed, she opened in Sept., 1852, a private reformatory school at Kingswood, four miles from Bristol, in a house built by Rev. John Wesley for himself. Her next book, *Juvenile Delinquents, their Condition and Treatment* (1853), pointed out the evils of massing together hundreds of vicious youths, and other defects of the system then in vogue. In 1854 she removed the girls of the reformatory school to a building in Bristol called Red Lodge, taking the sole management of it, and soon after took up her residence in a house adjoining. A national reformatory union was formed in 1856, and before it she read papers in that year and later. From the formation of the Social Science Association in 1857, under the presidency of Lord Brougham, until her death, she took an active interest in its proceedings, contributing every year one or more essays on the subjects which engrossed her thoughts. In 1858, Miss Frances Power Cobbe, returning from a visit to the East, became an assistant in the reformatory work, and took up her residence at Red Lodge. Miss Carpenter was diligent in calling the attention of Parliament to the need of reforms in regard to education. In 1859 she published *The Claims of Ragged Schools to Pecuniary Aid from the Annual Parliamentary Grant.* Pursuing the plan she had followed in founding a ragged school, she now, without waiting for Government action, established a certified industrial school. In June, 1861, she was called to give her testimony before a Parliamentary committee on the education of destitute children, and published a pamphlet, *What shall we Do with our Pauper Children?* A change in the laws with regard to schools now deprived the ragged schools of aid, and against this she vainly protested. Still continuing her labors, public and private, she published in 1864 *Our Convicts*, calling attention to the defects in the English mode of treatment, and the improvements which had been introduced in Ireland by Sir Walter Crofton, as well as to the agencies for the prevention of crime. This work was very favorably received in England, and was warmly commended in other countries, but was placed on the *Index Expurgatorius* at Rome. About this time the interest in India which had been implanted in her mind in early life, but had long been restrained by circumstances, was revived, so that she felt compelled to visit that land. Before leaving England, though now in her sixtieth year, she did a vast amount of work, that the various institutions with which she was connected might not suffer in her absence. The Government sent a recommendation of her to officials in India, declaring that "Miss Carpenter's opinion had for many years been sought and listened to by legislators and administrators of all shades of political opinion." Landing at Bombay, Sept. 1, 1866, she soon found before her an immense field calling for new activities. The first thing she noticed was the want of female teachers, and she urged on the Indian Government the establishment of female normal schools. She visited Poona, Madras, and Calcutta, where she was invited to the palace of the governor-general, Lord Lawrence. Her influence on the natives, both men and women, was very great, as they were astonished that a woman should come alone, at her own expense, thousands of miles to visit them and do them good. Even some who resided in distant parts of India sent her tokens of their regard. As she had opportunity she addressed the natives on subjects pertaining to their welfare, and these *Addresses to the Hindoos* were published in London and Calcutta. Upon her return to England she gave the result of her observations in a book called *Six Months in India* (1868). The work begun there needed her fostering care, and she went back in Nov., 1868. She became, without salary, lady superintendent of a normal school in Bombay, but an alarming illness in February following obliged her to return to England. Quickly she recovered, resumed her various labors, and in the autumn again made a short visit to India to stimulate and encourage those who were engaged in educational work. Henceforth, she felt there was not the same necessity for her immediate presence, but at the suggestion of some Hindoos she founded in Sept., 1870, at Bristol, a national Indian association, by which public opinion both in England and India might be influenced in favor of the changes she had inaugurated. In Jan., 1872, she turned her ragged school into a day industrial feeding school, so as to reach a still lower class of neglected children. In July the International Prison Congress met in London, and for this she prepared a little work on the Crofton system, besides taking an active part in its proceedings. She then went to

Darmstadt to assist in organizing a congress called by Princess Louise of Hesse to consider woman's work, and after the congress visited Switzerland. In 1873 she visited America, travelling from Boston southward to Fortress Monroe, where she attended the commencement of Hampton College for colored people, and then northward to Montreal. In all the cities she found troops of friends and numerous demands for her services in explaining reformatory work. The jail at Montreal she pronounced the worst she had ever seen, and immediately called Lord Dufferin's attention to it. She also sought to learn the condition of the Indians, and afterwards brought their needs before the English public. In the autumn of 1875 she made another visit to India, and was cheered on examining the practical results of the innovations and improvements she had suggested. Drawing near her seventieth year, she printed for circulation among her friends a little volume of poems, *Voices of the Spirits and Spirit Pictures.* Her work was done, and she quietly passed away, June 15, 1877. The citizens of Bristol have perpetuated her memory by an association to support homes for working boys and working girls, and a memorial tablet has been placed in Bristol cathedral, with an appropriate inscription by Rev. Dr. James Martineau.

CARPENTER, MATTHEW HALE (1824–1881), an American statesman, was born at Moretown, Vt., Dec. 22, 1824. His father having died when the boy was only nine years old, he was adopted into the family of Paul Dillingham, afterward member of Congress and governor of Vermont. After studying in 1843 and 1844 at the U. S. Military Academy, he studied law, and was admitted to the bar (1845), but afterward went to Boston and was received as a student into the law-office of Rufus Choate, who, perceiving the ability of the young man, gave him his entire confidence and encouragement. In 1848, Carpenter removed to Wisconsin, but, being stricken with inflammation of the eyes, went to New York for treatment. During three years of total blindness Choate supported him. Upon his recovery he returned to Wisconsin, and entered at once upon a successful practice. In 1855 he married Caroline, the youngest daughter of Gov. Dillingham, his early benefactor and friend. During the War of the Rebellion, Mr. Carpenter, barred on account of his imperfect sight from entering the army, lent to the Union cause the inspiration of his eloquence. In 1868 he delivered in the McCardle case an argument which at once gave him a position among the great constitutional lawyers of America. In 1869 he was elected to the United States Senate, and in 1873 became president *pro tempore* of that body. In 1879 he was again elected to the Senate, but his health gradually failed, and he died in Washington, Feb. 24, 1881, and was buried at his home in Milwaukee, Wis.

CARPENTER, WILLIAM BENJAMIN, C. B., LL.D., an English physiologist, was born at Exeter, Oct. 29, 1813. He is the eldest son of Rev. Dr. Lant Carpenter, a distinguished Unitarian theologian. His family having removed to Bristol in 1817, he was educated in that city, and there began the study of medicine, which he afterwards continued at London and Edinburgh. In the latter city he joined the Royal Medical Society, and as its president delivered the oration at its centenary commemoration in Feb., 1837. A paper which he read before this society "On the Voluntary and Instinctive Actions of Living Beings" contained the germ of much that he subsequently published on the nervous system. By his essay "On the Difference of the Laws regulating Vital and Physical Phenomena" he obtained the students' prize of £30, with which he purchased a microscope. In 1837 he became lecturer on medical jurisprudence in the British Medical School, and in 1838 published the first edition of his *General and Comparative Physiology.* In 1839 he obtained the degree of M. D. from the University of Edinburgh, and to his thesis a gold medal was awarded. Devoting himself specially to the study of physiology, he declined medical practice, and preferred to gain his livelihood by lecturing and authorship. In 1844 he was appointed Fullerian professor of physiology in the Royal Institution at London, and was also made a fellow of the Royal Society. In 1845 he began to lecture on general anatomy and physiology at the London Hospital. He was afterwards an examiner in the University of London and a lecturer on geology in the British Museum. When Dr. Forbes retired from the editorship of the *British and Foreign Medical Review*, the *Medico-Chirurgical Review* was united with it, and Dr. Carpenter, who had been a constant contributor on physiological subjects, was made the editor. In 1849 he was appointed professor of medical jurisprudence at University College, and in 1852 became principal of University Hall. Finding that this accumulation of duties interfered with his scientific investigations, he retired from the editorial chair, and thoroughly revised his great work on physiology, which he now divided into three —*Human*, *Comparative*, and *General*. In 1856 he was elected registrar of the University of London, and two years later, when the duties of this position were increased, resigned all other appointments, though he continued his original researches, especially on the *Foraminifera.* In 1868 the Royal Society, of which he was a vice-president, applied, at his suggestion, to the Government for the use of a vessel to carry on biological investigations in the deep sea. The request was granted, and Dr. Carpenter and Prof. Wyville Thomson sailed in the summer of that year in the Lightning. So great was their success that in the next year another voyage was made in the North Atlantic Ocean, and in 1870 and 1871, Dr. Carpenter went to the Mediterranean in the same way and for the same purpose. These deep-sea investigations aroused a remarkable interest, and preparations were made to carry them out on a still more extensive scale by the Challenger expedition. Dr. Carpenter would have taken charge of the expedition had not his friends dissuaded him on account of his age. In 1871 he was elected president of the British Association at its meeting in Edinburgh, and received the degree of LL.D. from the University of Edinburgh. In 1875, in recognition of his public services, he was made C. B. by the queen. In 1879 he resigned the registrarship of the university, and determined to employ his time entirely in original researches. In Sept., 1882, he visited the United States, attending the Unitarian convention at Saratoga and delivering a course of lectures before the Lowell Institute of Boston. The various publications of Dr. Carpenter have done much to diffuse a correct knowledge of physiology and to promote its study among all classes. He has contributed much to the *Cyclopædia of Anatomy and Physiology*, to the *Reports of the British Association*, the *Quarterly Geological Journal*, and the *Philosophical Transactions.* His chief works are—the *Principles of General and Comparative Physiology*, *Principles of Human Physiology* (9th ed. 1881), *Principles of Mental Physiology* (5th ed. 1879), *The Microscope and its Revelations* (6th ed. 1881), *Introduction to the Study of the Foraminifera*, *Physiology of Temperance and Total Abstinence* (1870).

CARPET-MAKING IN AMERICA. This industry is fairly entitled to consideration as one of the most progressive of the varied and important manufacturing interests of the United States.

See Vol. V. p. 112 Am. ed. (p. 127 Edin. ed.).

The first American carpet-manufacturer of whom there seems to be authentic record was William Peter Sprague, who some time prior to 1791 established a small factory for the weaving of Axminster carpeting in a part of the city of Philadelphia known as The Northern Liberties, and who came into public notice in that year through weaving an emblematic carpet for the United States Senate chamber, then situated in Philadelphia.

From 1791 to 1827 the carpet-mills established in the United States were few in number and small in productive capacity. During the latter year an incorporated company, organized by Orrin Thompson, commenced the manufacture of ingrain carpeting at Tariffville, Conn., with H. K. Knight as superintendent. The Tariffville mills speedily grew to pretentious proportions, and others were erected in Thompsonville by the same proprietor. This firm, however, failed, and their mills, originally started with only a few hand-looms, were bought by the Hartford Carpet Company, which was organized for that purpose. A few years later, the mills at Tariffville being destroyed by fire, the company abandoned that place and enlarged and improved the mills at Thompsonville, where there are now in active operation about 400 power-looms (in addition to a limited number of hand-looms) engaged in the manufacture of moquette, Wilton, and body Brussels, and three-ply and extra-super ingrain carpeting.

In 1828 the Lowell Manufacturing Company of Lowell, Mass., was organized. This corporation, now one of the largest carpet-producing companies in America, purchased the looms of a small factory started in Medway, Mass., in 1826, by Henry Burdett, of which Alexander Wright was superintendent. The Lowell Company was the first in the world successfully to manufacture carpeting on a power-loom, which they did in 1841, since which time they have added to their machinery till they are now running in the manufacture of Wilton and body Brussels and three-ply and extra-super ingrain carpeting nearly 350 power-looms, and have erected additional buildings with a view of starting about 60 more Brussels looms and many more ingrain looms.

In 1829, Andrew McCallum commenced the manufacture of ingrain carpeting at Germantown, Pa., thus laying the foundation for the Glen Echo carpet-mills, of which McCallum, Crease & Sloan of Philadelphia, Pa., are the proprietors, and of which the product of Wilton, body Brussels, and ingrain carpeting has been greatly increased through the erection of new mills at Wayne Junction in the northern suburbs of Philadelphia.

In 1834 there were about twenty carpet-factories in the United States, operating 511 hand-looms, of which looms there were employed in the manufacture of body Brussels carpeting 18; three-ply ingrain, 21; other grades of ingrain, 424; Venetian, 44; and damask Venetian, 4. Besides these, however, there were several hundreds of hand-looms used in the making of rag carpeting. In 1810 the carpet product of the country was computed to be 9984 yards, of which 7501 yards was reported as having been made in the city of Philadelphia alone; while in 1834 the product of the twenty factories then in operation was reported to be 1,147,500 yards, of an average value of about $1 per yard, there being, of body Brussels carpeting, 21,600 yards; three-ply ingrain, 31,500 yards; other grades of ingrain, 924,000 yards; Venetian, 132,000 yards; and damask Venetian, 8400 yards. In addition to this product, however, large quantities of rag carpeting, which cannot be accurately estimated, were made by families in nearly all parts of the country, the weaving of floor-covering and coverlets being then a common and familiar household employment.

About 1830 a little ingrain factory was started in the village of West Farms, near New York City, by Alexander Smith, from which originated the spacious mills of the Alexander Smith & Sons Carpet Company, situated at Yonkers, N. Y. These mills are among the largest of their kind in the United States. They are used for the manufacture of tapestry Brussels carpeting, in which 185 power-looms are employed, and of patent Axminster and moquette carpeting, in which 160 power-looms are employed. Like all the other American carpet-mills of this class, they are provided with ample spinning machinery and every modern appliance for transforming unwashed wool into yarn and worsted and weaving it into carpeting.

In 1840, A. & E. S. Higgins (now E. S. Higgins & Co., New York) started thirty ingrain hand-looms in Harsimus, Jersey City, N. J. They subsequently had a small mill in Brooklyn in 1844, which was destroyed by fire, and also carried on the manufacture of carpeting at Astoria and Haverstraw, N. Y., and at Paterson, N. J. In 1847 they erected extensive and substantial mills near the North River, on Forty-third Street, New York City, which they have since enlarged, and in which they are now running, besides extensive spinning machinery, upward of 260 power-looms engaged in the manufacture of velvet, Wilton, body Brussels, and tapestry Brussels, and various grades of ingrain carpeting. In 1840 also Robert Beattie, lately deceased, commenced the manufacture of ingrain carpeting on a small scale in New York City, whence in 1843 he moved to Little Falls, N. J., where the Beattie Manufacturing Company, organized in 1882, is now operating the Little Falls carpet-mills and the Little Falls felt-mills, which produce, in the aggregate, a large quantity of Brussels and velvet carpetings and felt and woven druggets.

The decade extending from 1840 to 1850 was characterized by greater progress than that of any previous decade, inasmuch as it was during this period that the power-loom was first successfully applied to the manufacture of carpeting, and also because, on account of the impetus imparted to carpet-making by this successful application, several extensive new carpet-mills sprang into existence, and the productive capacity of those previously established was immensely increased through extensive supersedure of the slow and clumsy hand-loom by the more swift and ingeniously-constructed power-loom. During this decade Erastus B. Bigelow, who was the first successfully to apply power-looms to the manufacture of carpeting, began to produce power-loom Brussels carpeting with his brother, H. N. Bigelow, in 1847, at Clinton, Mass.; and among other new factories founded were the mills of the Roxbury Carpet Company, which were started in 1848. The experiments of the Messrs. Bigelow resulted in 1854 in the incorporation of the Bigelow Carpet Company, which now has extensive spinning-mills and carpet-factories at Clinton, where there are about 50 power-looms engaged in the manufacture of Wilton and 100 power-looms in the production of body Brussels carpeting. The Roxbury Carpet Company has its mills at Roxbury, Mass., where it is operating 170 looms in the manufacture of tapestry Brussels, making also a limited quantity of tapestry velvet carpeting.

Among other carpet-mills of comparatively early origin in the State of New York, which are still in operation, may be mentioned those of Josiah Barber & Sons (established in 1832) and Nye & Wait (established in 1852) at Auburn, and of C. M. & E. P. Pelton (established in 1836) at Poughkeepsie, all of which produce only ingrain carpeting. Another of the large mills of New York State is that of Stephen Sanford, which from a small ingrain mill, started many years ago, has grown to be a factory in which 186 power-looms are employed in making tapestry Brussels carpeting, 60 power-looms in making three-ply carpeting, and about 125 hand-looms in making three-ply and tapestry ingrain carpeting. There are also in Glenham, N. Y., the Glenham Carpet-mills, started by the late A. T. Stewart & Co. in 1876, which are now running about 150 power-looms in the manufacture of body Brussels, tapestry velvet, and extra-super ingrain carpeting.

A new branch of carpet-making in America came into existence in 1849, when the Dolphin Manufacturing Company commenced the production of hemp or jute carpeting at mills established in Paterson, N. J., in 1844, for the manufacture of sailcloth. The Dolphin mills have been extensively enlarged since their beginning, and now employ about 900 operatives in the manufacture of upward of 2,000,000 yards of carpeting per year, besides large quantities of yarns and other fabrics of jute. Another large factory of this kind is that of the Planet Mills Manufacturing Company, situated in Brooklyn, N. Y. The Planet mills, which were built in

1869 and destroyed by fire and rebuilt in 1875, employ about 500 operatives, and produce about the same quantity of carpeting as the Dolphin mills, in addition to large quantities of yarns and of canvas used for floor oil-cloth foundations. The Columbia jute-mills of Philadelphia, Pa., and the Chelsea jute-works in New York City, also manufacture hemp carpeting, but on a smaller scale than the Dolphin and Planet mills.

The great carpet-making centre of America is the city of Philadelphia. Taking the lead in the volume of production at the very outset, this city has steadfastly maintained her prestige, and her factories to-day supply about three-fifths of the entire carpet product of the country. A history of the rise and progress of her 234 carpet-factories would fill a good-sized volume, and cannot, of course, be here given in detail, though a few of her many extensive mills may be briefly mentioned in passing.

The oldest carpet-manufacturer in Philadelphia now alive is probably the venerable John Bromley,[1] who began to manufacture ingrain carpeting with a single hand-loom in 1845. From this small beginning sprang the extensive factories of John Bromley & Sons, who now have upward of 350 looms employed in the manufacture of body Brussels, ingrain, and Smyrna carpetings. James, George D., and Thomas H. Bromley, three of the sons of John Bromley, withdrew from partnership with their father in 1869, and under the style of Bromley Brothers started a large mill for the manufacture of ingrain and Venetian carpeting. In 1881, Thomas Bromley bought out his two brothers, who, under the firm-name of James and George D. Bromley, started another large ingrain mill, so that the father and his sons are now proprietors of three separate mills, all of extensive capacity.

Another of the extensive carpet-manufacturing firms of Philadelphia is that of John & James Dobson, proprietors of the Falls of Schuylkill carpet-mills. This firm started as woollen manufacturers in 1857, and in 1871 added carpet-making as a branch of their business. Their spinning- and carpet-mills are among the largest in the country, and employ about 400 looms in the manufacture of ingrain, Venetian, and loop and cut-pile carpeting of nearly every description.

Horner Brothers, with whom we must close this part of our sketch, though not among the oldest of the Philadelphia carpet-manufacturers, are among the most extensive, and a new mill erected by them about two years ago is commonly regarded as the handsomest carpet-factory in the United States. They employ about 125 hand-looms in the manufacture of Venetian stair-carpeting, 61 power-looms on body Brussels carpeting, and have just commenced to produce tapestry Brussels, for which they employ 36 power-looms. They are now extending their weave-shed to accommodate 36 additional looms for the manufacture of body Brussels.

Statistics.—The extent of carpet-making in the United States has formed a subject for much discussion during several years past. Well-informed experts differ considerably in their estimates, but all place the productive capacity much higher than that accorded by the Government census, which they unanimously declare to be imperfect. The most trustworthy, and, in fact, the only thorough private census of carpet-making ever undertaken and completed, is undoubtedly that of Mr. Lorin Blodget, editor of the Philadelphia *Textile Record*, who, after a laborious canvass, compiled very comprehensive statistical details concerning the carpet-mills of Philadelphia at the beginning of 1880, of which a summary is as follows:

Number of carpet-manufacturers in Philada......	216
" " power-looms " "	1,346
" " hand-looms " "	4,132
" " yards produced per year..................	33,076,800

A general increase of about 20 per cent. is estimated to have ensued in the carpet-producing capacity of Philadelphia since the close of 1879, and from the data furnished by the private census just quoted, together with personal investigations by the writer, and information obtained from *The Carpet Trade and Review* of New York and other sources of admitted authenticity, it would appear that the following are approximate general statistics concerning the carpet-mills of the United States and their productive capacity:

Number of carpet-manufacturers in U. S.........	340
" " " power-looms " "	4200
" " " hand-looms " "	5000
" " " mill-operatives " "	22,000
" " yards of carpeting annually made in U. S...	63,000,000
Value (average of 80 cents per yard)	$50,400,000
Capital invested in carpet-making in U. S.......	25,000,000

The various kinds of carpeting which compose the foregoing estimated product, and the respective quantities computed to be made of each variety, are as follows:

Two-ply cotton ingrain,	yards............................	13,500,000
Two-ply woollen "	"	13,000,000
Three-ply " "	"	900,000
Tapestry Brussels,	"	13,500,000
" velvet,	"	1,000,000
Body Brussels,	"	7,500,000
Wilton,	"	600,000
Moquette,	"	1,200,000
Axminster,	"	250,000
Damask,	"	2,250,000
Venetian,	"	2,000,000
Hemp,	"	5,500,000
Smyrna,	"	300,000
Rag, list, etc.,	"	1,500,000
Total estimated production in yards...............		63,000,000

It is estimated that the carpet-mills of the United States annually consume about 70,000,000 pounds of wool, 22,000,000 pounds of cotton, and 22,000,000 pounds of jute, besides immense quantities of dyestuffs and other materials.

The geographical distribution of carpet-making in America, in comparison with the insignificance of the quantity manufactured in a few isolated sections of the country, is not specially extensive, the industry being mainly confined, as shown in our opening historical sketch, to the States of Pennsylvania, New York, Massachusetts, and Connecticut, these four commonwealths furnishing about 95 per cent. of the aggregate carpet-product of the Union. The District of Columbia and the States of Maryland, New Hampshire, New Jersey, Wisconsin, and Ohio produce the remaining 5 per cent., but their manufacture consists chiefly in the weaving of rag and list carpeting and low-grade ingrain carpeting on hand-looms, though, as already shown, there is a well-equipped carpet-mill (established forty-two years ago) in New Jersey, at which several grades of loop and cut-pile and felt carpeting are made, besides a large mill for the manufacture of hemp carpeting (established prior to 1850) in the same State.

Improvements in Machinery.—Scarcely more than twoscore years ago carpeting of all kinds and in all countries was woven only on hand-looms. Since then improvements in appliances for its better and speedier manufacture have gone hand in hand with the great increase of productive capacity of which they are a necessary adjunct. American inventive genius has been proverbially prolific in this field of enterprise, and has thereby conferred great benefit upon manufacturers both at home and abroad. Among the almost innumerable inventions of this class conceived in the United States there have naturally been some good and some bad, but of the failures we have no time to write, and for the American patents which have demonstrated their utility we have space only briefly to mention a few of the most prominent which are now in common and, seemingly, permanent use.

The rapid production of carpeting, not only in America, but also in all other countries, received its first

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[1 Mr. Bromley died on April 3, 1883, after the foregoing was written.—ED.]

genuine and practical impetus from Erastus Brigham Bigelow, an ingenious American inventor and a skilful manufacturer, who was born in the village of West Boylston, Worcester co., Mass., on April 2, 1814, and who died in Boston, Mass., on Dec. 6, 1879. In 1839, Mr. Bigelow invented a power-loom for weaving two-ply ingrain carpeting, which at that time was laboriously and slowly woven on hand-looms at the average rate of only from seven to eight yards per day for each loom. Mr. Bigelow's ingrain power-loom was at first capable of weaving only from ten to twelve yards of carpeting per day, but this capacity was soon increased to from twenty-five to twenty-seven yards, and subsequently to a considerably greater quantity.

The successful invention by Mr. Bigelow was preceded by an unsuccessful one by John Haight of the New Jersey Carpet-manufacturing Company, who, on May 17, 1834, was granted a patent for an ingrain power-loom, which was undoubtedly the first ever invented. By Mr. Haight's loom, however, the patterns of the carpeting which it produced would not match, so it was abandoned in 1836, and its proprietor reluctantly returned to the use of the hand-loom. Mr. Bigelow purchased the abandoned loom, and on April 20, 1837, patented a new loom, the product of which matched perfectly.

A few years after producing the first successful ingrain power-loom Mr. Bigelow, with equal success, applied its principles to power-looms for the weaving of body and tapestry Brussels carpeting, of which only from three to four yards per day could be woven on the primitive hand-loom, while by the new power-loom a daily product of from eighteen to twenty yards soon became possible; and this quantity, by means of improvements by Mr. Bigelow and other inventors, has since been increased about threefold in the production of body Brussels and fourfold in the production of tapestry Brussels carpeting.

Mr. Bigelow perfected his ingrain loom in 1845, and his Brussels loom in 1848, and subsequently organized the Bigelow Carpet Company, which is now the most extensive producer of fine Wilton and body Brussels carpeting exclusively in the world. In 1851, John Crossley & Sons, whose mammoth carpet-mills are at Halifax, England, bought Mr. Bigelow's patent-rights for Great Britain, and nearly all British carpet-manufacturers now use the Bigelow power-looms and their modern attachments.

The Bigelow ingrain looms have been improved from time to time by other American inventors, for whose genius, as well as for that of foreign inventors, they formed an ample basis for operation. Among the more prominent improvements may be mentioned those found in the Babbitt, Murkland, and Duckworth ingrain looms respectively, the chief merit of these improvements, aside from rapidity of weaving, existing in shading attachments, with which, by means of skilfully arranged sliding and revolving shuttle-boxes, a great variety of shading may be introduced into the patterns of ingrain carpeting, the Duckworth ingrain loom being particularly conspicuous on account of its compactness and simplicity and its rapidity of weaving.

Improvements in the Bigelow Brussels and tapestry looms in America seem mainly to have been made by the late Ezekiel K. Davis, formerly the master mechanic of the carpet-mills of E. S. Higgins & Co. in New York City; the late John C. Duckworth, his successor; William B. Duckworth, the brother and successor of John C. Duckworth; and John Hill of Philadelphia. Mr. John C. Duckworth's body Brussels loom is a noteworthy combination and simplification of the Bigelow, Crossley, Mark Smith, and Wield improvements, with a few original attachments and changes. His tapestry loom, the main feature of which may be regarded as the actuating wire-motion, is also notable for its compactness and remarkable rapidity of weaving. The validity of the claim by the late Messrs. Davis and John C. Duckworth to having invented an improved actuating wire-motion for removing the wires from pile fabrics during the process of weaving has been contested at law during the past eleven years by the Webster Loom Company of New York, whose president, Mr. William Webster, avers it to be an infringement upon a similar invention of prior date of which he claims to be the originator. Mr. Hill's improvement consisted of what is known as the "double-shed" movement, which consists of a mechanical combination by means of which the wires can be withdrawn and the threads simultaneously placed in the fabric, thereby obviating the necessity for forming an independent shed for the wire and two independent sheds for the threads, thus requiring only two revolutions of the crank-shaft for the completion of one loop or pile, instead of three revolutions, as had been previously required. Mr. Hill's invention was patented in 1847, and is still in popular use.

The American moquette power-loom is another product of native inventive genius which deserves special mention. This loom was invented in 1873 by Halcyon Skinner, then master mechanic for the Alexander Smith & Sons Carpet Company of Yonkers, N. Y., who also successfully invented the Smith Axminster power-loom in 1856. The original moquette loom has been from time to time improved by its inventor and his son, Charles E. Skinner, and it is protected by patents on both sides of the Atlantic. The Smith Carpet Company has 160 patent moquette looms in operation at Yonkers, and receives royalty on between fifty and sixty others which are run by the Hartford Carpet Company at Thompsonville, Conn., and on a large number which are used by foreign manufacturers.

The process of moquette-making is as simple as it is ingenious, and, stripped of its technicalities, it may be easily understood. The yarns which are to compose the tufts or cut pile of the fabric having been dyed of the desired colors (each yarn having only one color), are so wound on spools of the same length as the width of the carpeting that each yarn will be directly opposite to the point or place where it is to enter into the pattern. These spools are placed upon an endless chain in the order in which they are to be used, and have a spring at either end by means of which they are kept in position. When the loom is in motion the spools are automatically taken from the chain, and the yarns, guided by a series of small tin tubes, through which they are threaded, are seized by ingenious contrivances, and, having been carried down through the warp-threads, are bound in and turned up. A rotary knife or disk traversing the face of the fabric from side to side, and working against a stationary blade underneath, then cuts off the yarn, leaving the tuft in its permanent position, and by skilfully-arranged mechanism the spool is returned to the chain, which brings the next spool down to the level of the face of the fabric, and the process is repeated. When the fabric comes from the loom its surface is so nearly smooth that very little subsequent shearing is necessary to prepare it for market. The average productive capacity of these looms is about twenty-two yards each per day.

On July 9, 1881, Halcyon Skinner applied to the U. S. Patent Office for a patent for an improvement on his original invention, which has since been granted. Following is an abstract taken from the official description of this improvement obtained from the archives of the Patent Office at Washington, which will serve to illustrate the manner in which the tufts forming the pile of the moquette carpeting woven on these looms are fastened:

"*Brief.*—The warp is divided into sets of four threads each, the outer threads of each set passing alternately over and under the shoots of back filling and binding them together in pairs. The middle threads pass alternately over and under a shoot of tufting-filling and the back filling on each side thereof. When additional tufting filling-threads are employed, the outer warps of each set may alternately pass over the same.

"*Claim.*—1. The new fabric consisting substantially of warp-threads and filling-threads combined as above set forth—that is to say, with the shoots of two back filling-threads and the warp-threads forming a practically continuous backing, upon and to which the upper filling-thread is bound by some of the warp-threads. 2. The new tufted fabric consisting substantially of warp-threads, filling-threads, and tufting material combined as above set forth—that is to say, with the shoots of two back filling-threads and the warp-threads forming a practically continuous web, upon and to which the tufting-filling and the tufts are bound by some of the warp-threads."

Since the last-mentioned patent was issued Charles E. Skinner has invented an improved moquette loom, which is claimed to be a more rapid loom, and to be capable of making a moquette fabric largely combining the best features of both Axminster and Wilton carpeting, but it is not yet in operation.

A new moquette loom, invented by George Crompton of Worcester, Mass., was publicly exhibited in Boston during the autumn of 1882. This loom differs materially from the Smith-Skinner loom, inasmuch as it cuts the pile with a wire similar to those used on Wilton looms, but uses only one cutting wire. It is said that the productive capacity of this loom is forty yards per day, but thus far only an exhibition loom has been constructed.

Two of the most valuable appliances of their kind invented in America are the Lyall positive-motion shuttle, and the Lyall cop, the inventions of Mr. James Lyall, one of the founders and the superintendent of the Chelsea jute-works in New York City, and a brother of one of the founders and proprietors of the Planet mills in Brooklyn, N. Y. By means of the positive-motion shuttle, which is automatically carried instead of being thrown or projected through the warp-threads, carpeting of practically unlimited width may be woven. The Lyall cop is a condensation of the yarn for insertion in the shuttle without the use of a spool.

Apropos of the power-loom, it is related that, despite the leading part taken by the city of Philadelphia in the great industry of carpet-making in America from its earliest history, and notwithstanding that its utility had several years previously been demonstrated elsewhere, it was not introduced into Philadelphia till 1849, when John Markley is said to have lost money by its introduction. A similar experiment subsequently made by James Lord is also said to have resulted unprofitably. In 1856, however, McCallum, Crease & Sloan were successfully running Babbitt ingrain power-looms at their Glen Echo mills. The first ingrain shading-loom used in Philadelphia was a Murkland loom in 1870.

The distinguishing characteristics of American carpet power-looms are their ingenious simplicity, lightness combined with strength, rapidity of weaving, compactness, and the fact that they are so constructed that they may easily be managed by girls and women, who constitute a large proportion of the weavers employed in the carpet-factories of the United States. Improvement in power-looms has caused a great diminution in the number of hand-looms, which are now rapidly becoming only relics of the olden time.

Progress in Quality and Style.—In no particular has progress in American carpet-making been more marked than in the improvement which has taken place both in the quality and style of the carpeting produced. Starting from the diminutive Axminster factory of William Peter Sprague in Philadelphia at the close of the Revolution, the weaving of Axminster carpeting is now carried on in various localities with hand- and power-looms of an aggregate capacity for annually producing about 250,000 yards of the various grades of this ancient and aristocratic floor-covering. In other kinds of cut-pile carpeting still greater progress has been attained. Moquette weaving, which has been carried on only a few years, now employs over 200 power-looms, with a capacity for producing about 1,200,000 yards per year, and is likely to become far more extensive in a very few years. Wilton carpeting is made on about 100 power-looms, capable of weaving an annual product of about 600,000 yards. Velvet carpeting, of which the production was virtually merely nominal only a year or two ago, has made a sudden bound into popularity and increased in rapid ratio, especially during the past year, there now being nearly 200 velvet power-looms in operation, capable of turning out an annual product of about 1,000,000 yards. Body and tapestry Brussels carpeting, representing the loop-pile fabrics, have also made wonderful strides both in quantity and quality. Body Brussels carpeting is said first to have been produced in America by Isaac Macauley at the old "Hamilton Mansion" on Bush Hill, Philadelphia, in 1815, though it has been popularly supposed first to have been woven in Thompsonville, Conn., in 1826, while by some it is averred that the first body Brussels carpeting woven in America was at Lowell, Mass., in 1829. With the passing remark that the Macauley claim seems to be fairly authentic, we will simply state that there are now in operation in various towns and cities in the United States about 600 body Brussels power-looms, with an annual productive capacity of about 7,500,000 yards. The manufacture of tapestry Brussels carpeting in America has been commonly supposed to have been begun by Joseph Crawshaw (now of St. Louis, Mo.) in 1848, at the old mill from which sprung the extensive factory of the Roxbury Carpet Company, in the suburbs of Boston; but there is also a statement that the first tapestry Brussels carpeting woven in America was produced, though unsuccessfully, at Newark, N. J., in 1846. The American tapestry mills now employ about 1050 power-looms, capable of producing about 13,500,000 yards of carpeting per annum.

Ingrain carpeting has also been greatly improved, especially in the methods of weaving, so that it is now produced in patterns similar to those found in the more expensive kinds of carpeting; and a great variety of shading, which could not be done by means of the old-fashioned hand-looms, has been attained by means of the power-loom and its modern attachments. The first ingrain factory at which harness-weaving in America is said to have been carried on was situated in 1820 on ground now occupied by the *Herald* building, at Broadway and Ann Street, in New York City. This factory was operated by John & Nicholas Haight & Co., who subsequently removed to Jersey City, N. J., and, after unsuccessful experimenting with a power-loom which we have already mentioned, went out of business in 1838. There are now about 1500 power-looms and 3000 hand-looms employed in the weaving of ingrain carpeting of all kinds, with a productive capacity of nearly 30,000,000 yards per year. Damask, Venetian, and hemp carpeting, which may be classed under this general heading, have also made great progress, as we have already shown. The weaving of tapestry or "parti-colored" ingrain carpeting, however, which can be accomplished only by means of hand-looms, has become nearly obsolete, on account of the smaller cost at which a great variety of pattern and shading can now be attained by means of the improved power-looms. Tapestry ingrains, which were formerly made by several manufacturers in various places, and in considerable quantity, are now made only at the Sanford carpet-mills in Amsterdam, N. Y., where this product is very limited.

The manufacture of Turkey or Smyrna carpeting and rugs has also become an important feature of American carpet-making during the past three or four years. This branch of carpet-manufacture is almost wholly confined to the city of Philadelphia, where about 350 hand-looms turn out an annual product estimated to be worth about $1,500,000.

Rag carpeting, which has generally been largely ignored by statisticians, is produced in quantity sufficient to justify its recognition as a somewhat extensive factor in carpet-making in America, the aggregate product being estimated at about 1,500,000 yards, in which large quantities of new material from woollen- and cotton-mills and of shoddy yarns and other material are annually consumed.

A remarkable feature in the growth of carpet-making in America exists in the increase of the number of manufacturers who produce the finer grades of carpeting, which up to about 1870 were made at only a few mills, while now they are produced at many factories, and both supply and demand are steadily increasing.

Designing.—The art of designing carpet-patterns in America has fully kept pace with the great progress made in decorative art generally. During the past ten or twelve years especially there has been much attention given by American carpet-manufacturers to the production of artistic patterns. Formerly, the United States mainly relied upon England and France for designs, but the manufacturers now produce the greater part of the new styles in their own design departments. How much money is annually expended by American carpet-manufacturers for designing cannot be accurately estimated. It is, however, well known that several of the leading establishments annually expend fully $25,000 each in salaries to designers alone. On this basis it has been estimated that at least $250,000 per year is expended for salaries to designers, and that the total cost of maintaining the design departments is not less than $500,000. American styles of carpeting are remarkably varied and include every species of decoration. Natural floral styles and large figures in bright colors, which were formerly regarded as in a great degree distinctively American, have been extensively superseded by flat treatment with subdued color-effects, and the conventional styles which have been so long advocated by "high-art" devotees have been largely adopted by the general public, thus securing an admission from the critics that the tastes of the American people have improved, as well as the designs of the American carpet-manufacturers.

Consumption and Distribution.—Nearly all the annual product (63,000,000 yards) of the American carpet-mills (340 in number) is consumed in the United States. The population of the country being over 50,000,000, the average consumption *per capita* is about 1¼ yards, exclusive of oil-cloth and linoleum.

Some of the manufacturers sell and distribute the product of their own mills, for which purpose they keep an adequate force of travelling salesmen; others place the matter of sale and distribution in the hands of agents; while still others sell their goods outright to wholesale dealers known as jobbers, by whom they are in turn sold to and distributed among the retail dealers throughout the country. There are about 150 travelling salesmen regularly engaged in the sale of carpeting "on the road" in the United States. They make from two to four trips each per year, carrying an aggregate number of about 45,000 samples, valued at about $60,000 and weighing about 75,000 pounds. The total cost of selling carpeting by means of travellers is estimated at between $300,000 and $400,000 per annum. Much carpeting is also sold by local agents in cities.

The carpet-manufacturers and jobbers sustain an organization known as the Carpet Trade Association, which was inaugurated on Aug. 23, 1878, "for the protection and advancement of the business interests of its members." It is composed of leading manufacturers and jobbers of New York, Philadelphia, and Boston, and has its headquarters in the first-mentioned city. One of its principal features consists of a commercial-agency department, through which members may have credit investigations made to determine the degree of responsibility of dealers with whom they may have transactions or who may desire to open new accounts. There are in Philadelphia several associations among both the manufacturers and the mill-operatives, but their field of action is confined to that city alone, while that of the Carpet Trade Association is practically of national extent.

How Growth has been Promoted.—The great industry of carpet making in America has been developed under the fostering care of national legislation, of which Alexander Hamilton struck the keynote in a report which he submitted to Congress in 1791, recommending its encouragement by increasing the import duty on carpeting from 5 to 7½ per cent. Subsequent legislation from time to time has increased the original duty several fold. The effect on imports is seen in the fact that while nearly 7,000,000 yards of carpeting were imported into the United States in 1870, the annual importation is now only about one-twentieth of that amount, the present quantity being about the same as that of 1833, fifty years ago, when only 344,114 yards were imported. In conclusion, it may fairly be said that no branch of textile manufacture has made greater progress during the past forty years, or is manifesting more vitality and enterprise, than carpet-making in America. (W. A. H.)

CARRIAGES. Two circumstances have combined to give the art of carriage-making in the United States a peculiar and original character. The ease with which patents may be secured has stimulated invention, and the climate is favorable to the growth of excellent carriage-materials. The great extent of the country, the general wealth of the people, and the geology of the continent have also done much to give the art its present position. The distances between towns and the great area of the cities has created an enormous demand for vehicles to be used in the internal commerce of the country, while the prosperity of the people has encouraged a desire for pleasure-carriages. The geology of a country affects the character of its roads, and these in turn decide the character of the carriages used upon them.

See Vol. V. p. 48 Am. ed. (p. 134 Edin. ed.).

The most striking feature of American carriages is their lightness. This springs partly from the character of the woods employed and partly from the designs of the body and running-gear. The aim appears to be to employ the light and strong woods to the best advantage, and to reduce the power needed to move a given load. The inferior character of the roads, which are generally soft or sandy, has also led to the use of carriages that are light and yet strong. Different parts of the country have demanded different kinds and styles of vehicle to suit the character of the roads, and this has led to the invention of new forms of carriages, such as the buckboard, the mountain-wagon, the buggy, and many other varieties more or less related to them. While the conventional European styles of carriages have been closely copied in a few of the larger cities, the general tendency appears to be to modify those styles and to adapt them more nearly to American wants. The purely American types of carriages are likewise subject to endless variations, each of the great manufacturing centres producing novel forms or modifications and combinations of old styles every season. Every part of the vehicle and every tool used in its manufacture has been the subject of improvement, and a vast number of patents have been issued covering these changes. Some of these patents have proved of the greatest value to the art and to their owners, but the majority appear to be unimportant. The result, in the main, has been of benefit, as it has tended to cheapen production and improve the character of the work. Many of the more valuable patents have now become public property. In the large cities the cost of fine carriages has remained unchanged for many years. Throughout the country the average cost appears to have steadily declined. This has proved of great benefit to the trade, and has been accomplished in part by the general introduction of machinery, the division of labor, and the division of production. This last is perhaps the most striking feature of the art of carriage-making in America.

Manufacture.—The general plan upon which the manufacture is now conducted implies the subdivision of labor and the minute division of the business into small branches. each one having to do with the production of only a small part of a single carriage. One manufacturer may produce only wheels, or perhaps only spokes, hubs, or rims. Spring-making, body-making, shaft- and bow-making, or the manufacture of dash-boards, lamps, irons, or gears, may be a separate and distinct business. The carriage-materials—wood, iron, cloth, leather, etc.—and these parts of carriages are distributed from several great centres to the carriage-makers, who assemble the parts, trim, paint, varnish, and finish the vehicles. These are properly manufacturers of carriages. In only a few instances are all or nearly all the parts made in one shop from the raw material. In such places the finest and most expensive carriages are made, and these makers of single vehicles are probably at the head of the art. Where a single carriage is specially designed for a purchaser it becomes more nearly a work of art. This work demands artistic skill, and is rightly distinguished from manufacture, where carriages are produced in large quantities. all exactly alike. Besides the carriage-makers and manufacturers, there are also carriage-repairers. While making repairs their chief aim, these shops occasionally assemble the parts and make new carriages. Strictly speaking, the carriage-makers are the artisans who design carriages and assemble the parts, more or less of which they may purchase of others, and who sell them at wholesale or retail. The makers of parts of carriages are engaged simply in what may be called "accessory trades." There are also dealers in carriages who are simply merchants.

The making of carriages is naturally divided into four parts or stages of work. The first of these is body-making or wood-working; secondly, blacksmith-work, or reinforcing the wood-work with iron and steel; then follows the trimming or fitting up the top, seats, curtains, etc., which is practically upholstering; and lastly, the painting, decorating, and varnishing. The workmen are likewise classed as body-makers, blacksmiths, trimmers, and painters. These divisions of work mark the divisions of the accessory trades. These may be broadly divided into spring-makers. axle-makers, hub-, spoke-, and rim-makers, wheel-makers, manufacturers of trimmings, cloths, leathers, parts of iron-work or hardware, makers of bodies, and makers of paints and varnishes. Some of these are in turn subdivided into smaller trades. As an instance, the makers of lamps, dash-boards, neck-yokes, etc. may be classed as makers of trimmings. Wheel-making is divided into spoke-, rim-, and hub-making. These accessory trades, while widely distributed over the country, are in a few instances concentrated in single towns, the making of carriage hardware and trimmings being. for instance, concentrated at Newark. N. J., and the distribution of materials of all kinds at Philadelphia. Carriage-making is in the same way concentrated at a few great cities, some of these being in turn closely connected with other places, which serve, as it were, for workshops. New York, Philadelphia, Boston, and Cincinnati are great centres for the manufacture and sale of carriages, New York being supplemented by New Haven. Conn.; Philadelphia, by Wilmington, Del.; and Boston, by Amesbury. In Cincinnati the sale and manufacture are united, and at Amesbury, Mass., carriage-making is the leading interest of the town.

Construction.—The use to which the vehicle is to be put is practically decided by three considerations—the load, the power, and the road. When the use is known, the carriage-maker's first step is to elaborate the design. Designing carriages is an art demanding a thorough knowledge of mechanics, the strength of materials, the laws governing moving loads, and a good sense of artistic form. A lively appreciation of points requisite for the physical comfort of both man and beast is also needed. Carriage-designing is an art very largely controlled by precedent and fashion. It is more conservative than any other branch of the general art of design, yet it offers a good field for real talent and invention. While it is hampered by fashion, that places an unreasoning and unreasonable value on European patterns, the art of carriage-design is clearly improving and becoming more characteristic of the country and the times. There is an excellent school of carriage-designing in New York, and the technical journals frequently publish new and valuable patterns for the use of the trade. The design for the proposed carriage having been carefully drawn to scale, it is sent to the shop for the guidance of the actual workmen. Here comes the marked distinction between carriage-making or building and carriage-manufacture. In the manufactory a hundred vehicles of this design may be made at once. If it is a four-wheeled top buggy for a single horse, 200 pairs of wheels or parts of wheels, 100 bodies, 100 pairs of springs, 100 shafts, 100 seats, tops, dash-boards, etc., must be made or bought, and the whole work consists in assembling these parts into one hundred vehicles, all exactly alike. At the carriage-builder's one only of each part or pair of parts is needed, and these may be bought or made and put together to form a single vehicle.

Body-Making.—The materials used in making the bodies of carriages are chiefly ash, oak, hickory, and white wood. Iron must also be used, but practically the art of body-making is wood-working. Whatever the shape of the body, be it a mere box, as in an open buggy, or the most elaborate form of coach, phaeton, or coupé, the work is essentially the same. The frame or heavy portions of the body are of ash or oak, and the sides or panels and top are of white wood. Basket-work or woven willow or rattan is sometimes used for panels. In manufactories where a number of carriages of one pattern are made, the various parts to form the frame, sides, seat, top, etc., are got out in large quantities by machinery, all the parts being interchangeable. In making fine carriages, where only a few of a kind are made at once, much of this work is done by hand, the frames being cut out of solid lumber and the ornamental portions carefully carved. The work demands the very highest skill of the wood-worker, and may be not unjustly regarded as a fine art. Closely connected with body-making is the making of the wooden parts of the gearing or framing on which the body is supported.

Wheel-Making.—The making of hubs, spokes, and rims and whole wooden wheels is a branch of manufacture often quite distinct from carriage-making. The materials of wooden wheels are for spokes for heavy wagons oak, and for carriage-wheels hickory. Hubs are made of elm and gum, and rims of oak. In making spokes the rough sticks are cut to length and then placed in a spoke-lathe. The lathe used is a modification of the last-lathe, and is automatic in its action, the cutters following an iron pattern placed in the machine and forming every spoke exactly like the pattern used. These patterns are of cast iron, and very carefully copied from wooden models made by hand. The grinding and polishing of the spokes are done upon machines constructed for the purpose. Bands of canvas covered with sand or corundum are used in polishing the spokes. Hubs are sawn out in lengths from the round sticks, and are always turned upon a lathe by hand. Rims are got out by machinery from the log into lengths suitable for making half a wheel. After steaming they are put in a bending-machine and bent while hot into a half circle. They are taken from the machine in a former that retains them in shape. When cold and dry they keep their shape, and are ready to be formed into wheels. This steaming and bending give a rim with an unbroken grain, and leave the wood in a curved shape, but unharmed and quite as strong as when straight. Bows for forming the tops of carriages and curved shafts are bent in the same way. The assembling of these parts and the putting on the tire is the work of the wheelwright. In some factories the rims, hubs, and spokes are put together, and they are sold as wooden wheels to the carriage-makers, who put on the tires, paint, and finish them. In some of the larger carriage-works only the parts of wheels are bought, and in a few instances the wheels are made entire from the lumber in the carriage-shop.

A number of patents have been taken out on various methods of reinforcing the wooden hubs of wheels with iron. Some of these patent hubs have proved of great value, and have been widely adopted by the trade. The main idea underlying all the different patents is to apply metal rings to the hub to clasp or enclose in various ways the ends of the spokes inserted in the hubs. While these patent wheels are strong and durable, and of the greatest value in wagons and in all vehicles used on rough roads, they are not adapted to the finer class of vehicles used on pavements. They are strong, but inelastic, and the reinforcement of the hub only transfers the weak point of the wheel from the hub to the rim. In wagon-making the patent wheels are very largely employed, as the want of elasticity is not important.

Blacksmith-Work.—The blacksmith's shop is the most important part of every carriage-factory. The number of forge-fires makes a standard of comparison between shops—the more fires the greater the establishment. In this department of carriage-construction there is more opportunity for manual skill than in any other. While all the best iron-making tools that can be used in a forge are used in carriage iron-work, the art is, and must be, one of individual skill. Drop forgings and malleable-iron castings are very largely used in manufacturing carriage iron-work. Screws, bolts, clips, steps, rods, and other small parts are largely made in special shops, and under the name of carriage hardware enter into the work of every carriage-factory. At the same time, these parts must be forged to other parts or fitted to the wood-work they are intended to to reinforce, and this work must always be done by hand. All carriage-bodies, even of the most simple pattern, must be reinforced with iron, and this work must be done at the forge, each piece of iron being made and fitted to its special place and use. In the case of coach-bodies the wood-work is never sufficiently strong to sustain its load unaided, and the main frame must always be backed by heavy wrought-iron work. This work, together with putting the gears or running portion, the springs or suspension system, together, makes the work of the carriage-blacksmith.

The making of springs of all kinds is a branch of work quite distinct from carriage-making, none of the carriage-builders making their own springs. The material for springs is always steel, and the forms commonly used are the C-spring and various modifications of the elliptic spring. Wood is also largely used in the United States as a material for springs. This is shown in the side-bar vehicles and the buckboard. The side bar and the elastic board are not regarded as actual springs, yet in practice they are so used, and for this reason wood may fairly be said to be a material for springs.

The Trimming-Shop.—In this department of work machinery has been very largely used to produce the smaller parts—nails, tacks, buckles, laces, yokes, etc.—and the manufacture of what is called carriage trimmings has become a separate branch of business. The materials used in trimming carriages are leather, rubber, metals, and cloth. The art of carriage-trimming consists in fitting the top or hood; upholstering the seats; covering the wooden and iron portions of the tops with leather, rubber, and cloth; making the dash-boards, lamps, whip-sockets, cushions; and, in short, decorating and finishing the interior and all the parts not painted or varnished. There is field in this work for the display of considerable artistic skill, and in this respect the work of American shops appears to be fully equal to anything seen in Europe. At the same time, American carriage trimmings and fittings show a greater variety and more freedom in decoration, with vastly more conveniences, than English or French work of the same class. Nickel- and silver-plating is much used in American trimming to protect metallic surfaces exposed to much wear.

The last step in carriage-making is the painting and varnishing. The manufacture of paints and varnishes has been carried to a very high degree of perfection, and is everywhere a distinct branch of work from carriage-making. The prevailing colors used in painting carriages are black, dark green, and dark blue, and sometimes bright shades of red.

Kinds of Carriages.—The art of carriage-building grew out of the art of coach-making, and was of European origin. For this reason the principal types of carriage forms are European. The essentially European vehicles are the coach, clarence, landau, coupé, phaeton, chaise, and all those more or less related to these. The American forms are the rockaway, the buckboard, the sulky, and the American buggy. While only four, or if the mountain-wagon be included only five, distinct forms of carriages have originated in the United States, it must be observed that all the European types have been made and used in this country, and every foreign type has been made the subject of many modifications. So much has this been done that there is very great confusion of names in the styles. In many instances the names have been compounded in the effort to express rather shadowy differences of form.

Of the four American types of carriage, the rockaway is a two-seated vehicle with a fixed top, and probably grew up from a simple wagon over which a canopy was spread. The buggy is a single-seated four-wheel vehicle with or without a top, the two pairs of wheels being very nearly of the same size. It naturally sprang from a desire for a light vehicle suitable to rough roads in a new country. It also met the desire for a light vehicle for speed. The American sulky for racing purposes has been thought to be related to the single-seated vehicle known as the désobligeante. The name might suggest this, yet it is clearly an American invention. The buckboard is a four-wheeled vehicle without gearing or springs. A long elastic board is bolted directly to two pairs of wheels. A seat is placed in the middle, the elastic board serving at once for gear, springs, and body. It has become very popular in mountainous pleasure-resorts. The mountain-wagon is an open wagon with three or four seats, and is becoming popular as a pleasure-wagon for large parties. In none of the American types of carriages is there any provision for a separate seat for the driver. In this respect they are essentially democratic, and sharply marked from the majority of European types, where the driver always occupies an inferior position in the vehicle.

The types of carriages introduced into this country under the name of village carts, T carts, and dog carts are all of English origin, but have been adopted here, and both changed and improved in design and construction.

The system of suspension known as the side bar is of American invention. In side-bar vehicles the body is suspended by means of springs between two bars of wood supported by the axles, and forming a square solid frame or gearing. The side bars are elastic and serve as springs. The side-bar system is largely used in the lighter classes of buggies and two-seated wagons, both with and without tops.

Statistics of Carriage Production.—In 1882 there were in the United States 16,875 carriage-builders and repairers, including sleigh- and wagon-makers. There were also in that year 2692 individuals and firms in the accessory trades. The carriage-making interest is represented by one or more shops in every State and Territory except Arizona and Idaho. The following are the leading centres of the trade, arranged in the order of the number of establishments in each: New York, 139; Philadelphia, 110; Brooklyn, San Francisco, Cincinnati, Providence, Chicago, St. Louis, Baltimore, Louisville, Washington, and Cleveland, 25 each; and Boston, Buffalo, and Detroit, 23 each. Other places have a less number, and very few towns or villages are so small that at least one carriage-repairer cannot be found. Amesbury, Mass., is an important centre, because carriage-making is almost the only interest. The product of this town in 1881 was 18,000 carriages. In the twenty leading centres of the carriage-trade $9,910,416 is invested in capital, and employment is given to 11,818 men and 1000 women and children. The distribution of the capital and labor does not follow the number of establishments. Cincinnati, with only 50 shops, employs 2694 men, while Philadelphia, with 110 shops, employs only 1562. This shows that the size of the establishments is larger, there being twice as many men in one shop in Ohio as in a shop in Pennsylvania. The total wages paid in twenty leading cities amounted in 1881 to $5,543,258; the cost of the materials consumed reached $9,005,707; and the total product was valued at $19,448,318. The cost of materials used in making carriages in the whole United States reached $28,738,496. The finished product was valued at $56,254,718. In carriage- and wagon-materials 332 establishments, with a capital of $6,131,485, gave employment to 6677 persons; the wages paid in 1881 amounted to $2,230,408; the materials cost $4,016,200; and the product was valued at $8,403,411. (C. R.)

CARRIER, COMMON, one who holds himself out to the public as ready to carry for hire from place to place the goods of such persons as choose to employ him. The general principles of the common law relating to the duties and responsibilities of common carriers are the same in the United States as in England, and in many of the States statutes have been enacted defining more particularly their duties and their liability to the public who employ them. As communication by railroad has been greatly extended, and inter-communication in trade between the different States thereby largely increased, this branch of the law has become

See Vol. V. p. 122 Am. ed. (p. 138 Edin. ed.).

of great importance, and a singular unanimity is found in the decisions of the courts of the different States, based upon the general principle of the common law derived from England, and originally found in the civil law, that the contract of a carrier of goods is one of indemnity. Some difference has existed between the law in England and in this country as to the extent of the liability of a common carrier who receives goods to be sent to a destination beyond his own route, and delivers them to another carrier to be taken there; but in this country, where, by reason of the great distances of shipment by land and by water, and the necessity of using therefor more than one line of railway or of water-transportation, this is generally made the subject of a special contract to which the shipper of the goods becomes a party, and the responsibility of the carrier must in such case be measured by the express terms of the contract. The best text-books on this subject are the books of Redfield and of Angell *On Carriers*. (S. W.)

CARRIERE, Moritz, a German philosophical and æsthetical writer, was born at Griedel, in Hesse, March 5, 1817. He studied philosophy at Giessen, Göttingen, and Berlin, and then spent some years in Italy in the study of art. In 1842 he became a lecturer on philosophy at Giessen, and in 1849 he was made professor there. In 1853 he was called to the University of Munich, where he gave special attention to æsthetics. He also lectured in the Art Academy on the history of the fine arts. One of his earliest publications was *Die Religion in ihrem Begriff* (1841); he afterwards translated the letters of Abelard and Héloise and added a sketch of their lives. In his work on *Die philosophische Weltanschauung der Reformationszeit* (1847) he traced the course of philosophy from the schoolmen to Descartes, giving original views of Giordano Bruno and Jacob Böhme. His *Religiöse Reden und Betrachtungen für das Deutsche Volk* (1850) is a defence of revelation against pantheism and deism. His treatise on *Das Wesen und die Formen der Poesie* (1854) was the forerunner of his *Aesthetik* (1857; 2d ed. 1873). In his illustrated work on art, *Die Kunst im Zusammenhang der Kulturentwickelung und die Ideale der Menschheit* (5 vols., 1863–73; 3d ed. 1877–80) he endeavors to combine philosophic insight with historical truth. His views of moral philosophy are set forth in *Die sittliche Weltordnung* (1877). He edited Goethe's *Faust* (1869) and Schiller's *Wilhelm Tell* (1871), and has published some poems, among which are *Die letzte Nacht der Girondisten* (1849) and *Agnes: Liebeslieder und Gedankendichtungen* (1883). He took a prominent part in opposition to Ultramontanism.

CARROLL of Carrollton, Charles (1737–1832), an American statesman, was born at Annapolis, Maryland, Sept. 20, 1737. O'Hart, in his *Irish Pedigrees*, traces the family to an early king of Munster, and asserts that the more recent ancestors were called princes or barons of Ely, from an estate in Leinster. In 1688, Charles Carroll, who had been secretary to Lord Powis, came to America, and, settling at Annapolis, became the agent of Lord Baltimore, the proprietary of Maryland. He obtained several large grants of land, one of which, on the Patapsco River, was called Ely O'Carroll. His business capacity and prudent management enabled him to retain his position as agent of the proprietary for thirty years, and his talent seems to have been inherited by his descendants. His son Charles, born at Annapolis in 1702, succeeded to his rich estates and married Elizabeth Brooke. Charles, their son and only child, afterwards called "of Carrollton," was sent to France in 1745, and was educated at the college of the English Jesuits at St. Omer, France, at the French Jesuit college at Rheims, and at the college of Louis le Grand in Paris. He studied law in Bourges, Paris, and London, returned to America in 1764, and married Mary Darnell in 1768. His vast estates rendered him at the outbreak of the Revolution the richest man in the colonies, yet he was ever an ardent friend of liberty. As early as 1770 he had protested on behalf of the people against an arbitrary attempt of the royal governor to impose taxes. Under the name of the "First Citizen" he carried on a vigorous controversy with Daniel Dulany, the secretary of the province, who wrote under the signature of "Antilon," and had a high reputation for ability and eloquence. In 1773 the protest against taxes imposed without the consent of the representatives of the people took a wider range when the British government, in the interest of the East India Company, attempted to overcome the refusal of several American colonies to receive tea on which duties had been levied. In October a brig arrived at Annapolis with a cargo of the obnoxious article. The leading citizens showed such determined spirit of opposition that the consignee, following the advice of Mr. Carroll, allowed the vessel to be burned to the water's edge. The opposition to the policy of the British ministry increased to such an extent that on Dec. 8, 1774, a State convention was held, and Charles Carroll, triumphing over the prejudice which had long disfranchised Roman Catholics in the colony founded by one of that faith, sat as a member of this body. About this time he assumed the designation "of Carrollton," from the family estate in Frederick county, to distinguish him from another member, Charles Carroll, barrister, also born in Annapolis. In 1775 he was chosen a member of the first committee of observation established at Annapolis, and a delegate to the provincial congress. In February, 1776, the Continental Congress appointed Dr. Benjamin Franklin, Charles Carroll, and Samuel Chase commissioners to visit Canada for the purpose of securing the assistance of the people there in the struggle for independence. Rev. John (afterwards Archbishop) Carroll also went with them by special invitation. A journal of this unsuccessful mission, with a memoir by B. Mayer, was published in 1845. On his return, in June, 1776, Mr. Carroll found the delegates from Maryland embarrassed on account of instructions given by the legislature "to disavow in the most solemn manner all design in the colonies of independence." He hastened to Annapolis, secured the repeal of these instructions, and on July 4 was himself elected delegate. On Aug. 2, when the Declaration of Independence was formally signed by the members of Congress, he was one of the first to attach his name. The story that he then first used the addition "of Carrollton" is incorrect. He was afterwards one of the committee that prepared the constitution of Maryland, and was several times a member of the State senate. In 1777 he was again a delegate to Congress, and in 1788 was elected to the United States Senate, where he acted with the Federalists in the political struggle. He vacated his seat in 1791, and was again chosen to the State senate. In 1799 he was one of the commissioners to fix the boundary between Maryland and Virginia. In 1801 he retired from public life, and spent his time in the management of his estate. The death of Thomas Jefferson and John Adams on July 4, 1826, left Charles Carroll of Carrollton the only surviving signer of the Declaration of Independence. In the funeral ceremonies held in memory of them in Baltimore, as in all the leading cities, Mr. Carroll was the chief mourner. On July 4, 1828, being then in his ninety-first year, he inaugurated the Baltimore and Ohio Railroad amid imposing ceremonies, which included a procession representing all the trades. This was his last public appearance; his strength gradually declined, and he died peacefully in the home of his daughter at Baltimore, Nov. 14, 1832. Throughout his life he was noted for his dignified manners, unfailing courtesy, and regard for the rights of others. His only son, Charles, married Harriet, daughter of Hon. Benjamin Chew, chief-justice of Pennsylvania. One of the daughters, Catharine, was married to Robert Goodloe Harper, a distinguished Maryland Federalist and advocate of the colonization movement. The other daughter, Mary, was married to Richard

Caton of Maryland, and her four daughters were noted for their beauty. Three of them were married to English noblemen, and were known at the court of George IV. as "The American Graces." When the marquis of Wellesley, to whom the eldest was married, became lord lieutenant of Ireland, Bishop England of Charleston, S. C., gracefully referred to the fact, as well as to her beauty, by proposing as a toast on one occasion, "Charles Carroll of Carrollton: in the land from which his father's father fled in fear his daughter's daughter reigns a queen." The fourth daughter, Emily, was married to Mr. John McTavish, a gentleman of Scotch descent and for a long time British consul at Baltimore. The family retains its social prominence in Maryland, and when the Centennial anniversary of American Independence was celebrated, Hon. John Lee Carroll, great-grandson of Charles Carroll of Carrollton, as governor of Maryland took a prominent part in the ceremonies at Philadelphia on July 4, 1876.

CARROLL, JOHN (1735–1815), the first bishop and archbishop of Baltimore, primate of the American Catholic Church, was born at Upper Marlboro', Md., Jan. 8, 1735. He was the third son of Daniel Carroll and first cousin of Charles Carroll of Carrollton. After a short attendance at a grammar-school he was sent to the college of St. Omer in France, where he distinguished himself by his intellectual gifts, his attention to his studies, and the sweetness of his disposition. After passing successfully through the usual course then taught at St. Omer, he was transferred to the Jesuit college at Liége, where he devoted himself to the higher branches of literature and science. Here he formed the resolution of embracing the ecclesiastic state in the Society of Jesus. He was ordained in 1769, having resigned in favor of his brother and sisters the estate bequeathed to him by his father. After his ordination he taught the higher classes at St. Omer and Liége until 1773, when the Society of Jesus was suppressed. After that event Father Carroll was induced by Lord Stourton, a Catholic nobleman of England, to accompany his son on a Continental tour. Upon his return to England he accepted an invitation from the earl of Arundel to reside in his family as private chaplain. He remained at Wardour Castle a year or two, when his love of country induced him to return to his home, which was then on the eve of the struggle for independence. He engaged in missionary duties in Montgomery co., Md., where his mother, brother, and youngest sisters resided. He also extended his labors to Stafford co., Va., where two married sisters lived. In 1776 he was called away from his parochial duties to accompany Dr. Franklin, Samuel Chase, and Charles Carroll, the commissioners appointed by Congress to visit Canada in order to secure the co-operation of that country in our struggle for independence.

At the close of the Revolution the American Catholic clergy, wishing to establish a hierarchy of their Church independent of England, applied to the pope for the appointment of a vicar apostolic for the Catholic Church in the United States, at the same time nominating and recommending Father Carroll for the position. In June, 1784, he received the appointment, and removed to Baltimore. At that time there were 16,000 Catholics in Maryland, 7000 in Pennsylvania, and 1500 scattered through the other States. There was not a single bishop in the United States, and only fourteen priests; in less than a century the Catholic population has increased to about 8,000,000, with one cardinal, fourteen archbishops, sixty bishops, and nearly five thousand priests.

In 1789, Dr. Carroll was appointed the first bishop of the United States, with his see at Baltimore. Early in the summer of 1790 he sailed for England, and was consecrated by Bishop Walmsley, the senior vicar apostolic of the Catholic Church in England, on the 15th of August of the same year, in the chapel of Lulworth Castle, the seat of his old friend Thomas Weld, Esq. Within a month after his consecration he left England, anxious to engage in the active duties of his immense diocese, which embraced the whole of the then United States. In 1791 he founded Georgetown College, D. C., which was the first Catholic college established in this country. Bishop Carroll won the respect and admiration of all classes and religious sects by his learning, gentleness, and Christian charity. When Washington died he was invited by Congress and the clergy of all denominations in the United States to deliver a panegyric on the Father of his Country, and on the 22d of Feb., 1800, he complied with the request; and of all the many discourses called forth by that melancholy event there was none more eloquent than that of the accomplished bishop of Baltimore. The corner-stone of the handsome cathedral of Baltimore was laid by Bishop Carroll on the 7th of July, 1805, but the church was not finished until nearly forty years after. On the 8th of April, 1808, Dr. Carroll was elevated to the dignity of archbishop, and four other sees were created—viz. New York, Philadelphia, Boston, and Bardstown, Ky. Archbishop Carroll continued to watch over the Church with unabated zeal until his death, on the 3d of Dec., 1815, in the eightieth year of his age.

(E. L. D.)

CARROLLTON, the county seat of Greene co., Ill., is 65 miles N. of St. Louis, on the Kansas City branch of the Chicago and Alton Railroad. A railroad from Litchfield, 40 miles E., is also projected to pass through the city. It has three hotels, a national bank, two other banks, three weekly newspapers, six churches, two schools, and a park. Its industries comprise a foundry, a carriage-factory, and four flour-mills. It was settled in 1835, and incorporated as a city in 1868. It is free from debt; its yearly expenses are $5000. The population, mostly of Southern origin, numbers 1934.

CARROLLTON, the county-seat of Carroll co., Mo., is on the Wabash, St. Louis, and Pacific Railroad, 209 miles N. W. of St. Louis and 66 miles E. of Kansas City. It has two hotels, two banks, a fine court-house, a public library, three weekly newspapers, eleven churches, a convent, and good schools with a commodious building, a woollen-mill, and other manufactures. It was laid out in 1833, incorporated in 1847, and in 1871 chartered as a city. Population, 2313.

CARROT. This well-known plant belongs to the

See Vol. I. p. 328 Am. ed. (p. 369 Edin. ed.).

natural order *Umbelliferæ*, and is the *Daucus Carota* of Linnæus. It was formerly associated with *Pastinaca*, under which name its ancient history is to be sought. The exact origin of the carrot has never been ascertained, though the belief is general that the ordinary wild carrot is its parent, and this, therefore, has received the name of *Daucus Carota*. So far as it has been recorded, however, all attempts to produce from the wild plant roots similar to those cultivated have failed. No details of the manner of experimenting have been given. It appears from a note by Dr. Salmon in his *Herbal* that the plant can be made to change some of its character by art. His book was published in 1705. He remarks: "In Carolina I saw a carrot above four years old, which brought forth its ripe seed in the fifth year: the reason thereof I conceive to be, because the master of the house cut off every year its green tips (flower-stalks) that it might not seed, whereby the root grew very great, as also the green head the fifth year; which was four or five times as big as any ordinary carrot head. This head he let stand for seed, and it produced him an incredible quantity thereof, very fair and twice the size of ordinary carrot-seed." No improvement is, however, recorded anywhere. Though the wild plant is a native of Britain, the cultivated form appears not to have been known till introduced from Holland about 1558. The wild carrot is a native also of Greece, where are five other species. America has one species, *Daucus pusillus* of Michaux, a native of the Gulf States, but of no value so far as known; indeed, the common carrot is known as a weed on slovenly farms or as a wild plant in uncultivated places.

The umbel of flowers is white, but there is generally one crimson flower in the central umbellet; and it is interesting as showing how circumstances modify plant-behavior to note that, while European authors record this flower as fertile, in America it is only in the first umbel of flowers of the season that the crimson flower in the central umbellet perfects seed.

Carrots contain a large proportion of sugar, and some have believed that spirits could profitably be distilled from them. An analysis shows the root to contain of water, 87·5; albumen and casein, 0·6; sugar, 6·4; fat, 1·2; gum, 1·0; woody fibre, 3·3; mineral matter, 1·0. Experiments in England gave from 42 bushels of carrots 50 gallons of spirits, which yielded 12 gallons of rectified spirits.

For cattle-feeding carrots have proved excellent, especially for horses. Horses which have had 10 pounds of oats per day have been found to do just as well on 2 pounds of oats and 5 pounds of carrots; and 250 pounds of carrots have been found equal to 100 pounds of meadow hay. Even the mole is fond of sweet things, and pieces of carrot have been found excellent baits in mole-traps. It is said that 830 bushels, or 20 tons to the acre, have been raised in Maine; 700 bushels is the heaviest crop that appears to be on record in England. (T. M.)

CARSON, Christopher (1809–1868), commonly called "Kit Carson," a Western hunter and soldier, was born in Madison co., Ky., Dec. 24, 1809. While he was an infant his family removed to Missouri. At the age of fifteen he was apprenticed to a saddler, but two years later he joined an overland trading expedition to Santa Fé. Attracted by the freedom of life on the Plains, he became a trapper and roamed over the country between the Rocky Mountains and the Pacific. He became expert in all that pertains to the hunter's life, and surpassed the Indians in fertility of resource and keenness of observation. For sixteen years his rifle furnished nearly every particle of food on which he lived. In 1831, Messrs. Bent and St. Vrain, the proprietors of an Indian trading-post, engaged him to supply their fort with provisions and furs. Gradually the report of his romantic adventures gave him a wide reputation. In 1842, after the death of his Indian wife, he brought his daughter to St. Louis to be educated. Here Lieut. John C. Fremont was preparing his first expedition to explore the Rocky Mountains, and was glad to secure the services of the famous hunter. The expedition lasted from June to September, and in it Fremont discovered and ascended the peak which bears his name. In 1843, Carson returned to New Mexico, married a Spanish lady, and resumed hunting and trapping for his former employers. Accidentally meeting Fremont on his second expedition, Carson joined the company, and continued with him during the military operations which resulted in the conquest of California in 1846–47. Carson was then sent with despatches to Washington, and while in the East was nominated by Pres. Polk as a lieutenant in the U. S. rifles, but the Senate in the following January rejected him. He now settled down in New Mexico, and in 1853, on account of the demand for sheep in California, gathered a flock of 5000, drove them over the mountains, and sold them at a high price. This visit to California again attracted public attention to his name, and when he returned to New Mexico he found that he had been appointed by the general Government Indian agent for that district. By his knowledge of Indian character, his fidelity to his engagements, and the universal respect in which he was held by the tribes he succeeded in negotiating several important treaties. When the Civil War broke out he remained faithful to the Union and rendered signal service to the cause. He was made colonel of the First cavalry of New Mexico, and was brevetted brigadier-general for meritorious conduct during the war. At its close he resumed his duties as Indian agent. In the early part of 1868 he visited Washington with a deputation of Indians, and made a tour of the Northern and Eastern States. He was as modest as he was brave, and shrank from public notice. Just after his return to the West he died at Fort Lyon, Col., May 23, 1868.

CARSON CITY, the capital of the State of Nevada, is a city of Ormsby county, on the eastern side of the Sierra Nevada, 16 miles S. of Virginia City, on the Virginia and Truckee Railroad. Besides the State Capitol, it contains the United States mint, six hotels, two banks, four daily newspapers, four churches, three schools, and an orphans' home. In was settled at 1857 and incorporated in 1876. Its property is valued in $2,000,000; its public debt is $63,000, and its expenses for 1881 were $10,638. It is surrounded by grand mountain-scenery, is lighted with gas, and furnished with water-works. Its prosperity is due to the gold- and silver-mines of the vicinity; there are in the city five quartz-mills, also the railroad car-shops and office, a foundry, and a soap-factory. Population, 4229.

CARTERSVILLE, the county-seat of Bartow co., Ga., is 49 miles N. W. of Atlanta and 90 miles S. of Chattanooga, on the Western and Atlantic Railroad, and is the terminus of the Cherokee Railroad. The latter, now completed to Cedartown, Ga., is to be extended to Birmingham, Ala., through the coal-fields of that State. Two other railroads are projected—one to Gainesville, Ga., and the other to Maryville, Tenn. The latter will pass through a country rich in iron ore and manganese. Cartersville has a fine court-house, opera-house, a bank, three hotels, two weekly newspapers, seven churches (three for colored people), and seven schools. Its industries comprise the Georgia Car Company's works, a foundry, baryta-mills, and a large carriage-factory. It carries on a large trade in lumber, iron, and cotton. Its property is valued at $750,000, and its yearly expenses are $5500. Population, 2037.

CARTHAGE, the county-seat of Jasper co., Mo., is half a mile south of Spring River, 10 miles east of the Kansas boundary, and 150 miles south of Kansas City, on the St. Louis and San Francisco Railroad and on the Missouri Pacific Railroad. It has a fine courthouse, seven hotels, four banks, two daily and four weekly newspapers, a public library, nine churches, and a handsome school-building with eighteen departments. The industries of the town comprise a woollen-mill, a saw-mill, four flour-mills, a foundry, three marble-works, and manufactures of carriages, wagons, ploughs, furniture, barrels, and cigars. Carthage was first settled in 1841, but during the Civil War was entirely destroyed. It was rebuilt in 1866, and incorporated in 1873. Its property is now valued at $1,125,000, and its public debt is $9000. In 1881 the public expenses were $12,400. It has two parks, gas- and water-works. The surrounding country is favorable for agriculture, and there are twenty flour-mills in the vicinity. There are also limestone quarries and zinc- and coal-mines. The population, chiefly of Northern birth, in 1880 numbered 4176.

Near the town a battle was fought July 5, 1861, between Federal troops, numbering about 1500, under Maj.-Gen. Franz Sigel, and the Missouri State troops, 5000 strong, commanded by Gens. Parsons and Rains, under the general orders of Gov. Jackson of Missouri. These latter were supposed to be marching to join Gen. McCulloch in Arkansas. Sigel encountered them about eight miles from Carthage, posted upon a ridge near Brier Creek, with the artillery, four guns, in the centre, the infantry in the rear, and the cavalry (a large contingent) on both flanks. His own command consisted of the Third and a battalion of the Fifth Missouri Union volunteers, two companies being of artillery, and a small body of regulars. He opened upon the enemy with his guns, which created great havoc and so scattered their cavalry that they could not charge. Their centre gave way after two hours' fighting, but it was soon manifest that a force of 1500 had been detached to cut off his baggage-train, which had been left 3 miles in the rear. He was therefore obliged to call up the train and to retreat towards it. He was successful in reaching it, and, placing it in the centre, he then cut through the cavalry in his rear and continued his retreat. Again he found himself impeded by a force posted on a bluff overlooking the only road. Making a feint on the right and left, as if trying to escape, he gained an oblique artillery-fire in both directions, and charging in front he again cleared the road. Thus retiring and fighting, he reached Carthage, harassed by superior numbers. Thence he marched to Sarcoxie, reaching it on the morning of July 6. His entire loss was 13 killed and 31 wounded, while that of the enemy was between 350 and 400. The fighting on the Union side was principally with artillery, which was well served and did great execution. (H. C.)

CARTHAGE, a village of Jefferson co., N. Y., is on the E. bank of Black River and on the Utica and Black River Railroad, 74 miles N. of Utica. A branch of this railroad connects it with Watertown, 17 miles W., and it is connected with West Carthage by a bridge. From this point to Lake Ontario the river descends, in a series of rapids, 480 feet. The dam at the head of the falls, built and maintained by the State, is 900 feet long, and causes slack-water navigation for 22 miles. The abundant water-power is used in manufacturing pig iron, wooden ware, wood-pulp, wooden and steam pumps, leather, lumber, carriages, doors, sash, blinds, stoves, axes, car-wheels, and many kinds of machinery. The town has a bank, a weekly newspaper, seven churches, a monastery, a graded school and other schools. It was settled in 1798, and for a time was called Long Falls; it was incorporated in 1841. Population, 1912.

CARTWRIGHT, PETER (1785–1872), one of the most remarkable characters among the pioneer preachers of the Methodist Episcopal Church, was born in Amherst co., Va., Sept. 1, 1785, and died at Pleasant Plains, Ill., Sept. 25, 1872. In 1793 his father, a soldier of the Revolutionary war, removed to Logan co., Ky., Peter being at the time eight years of age. It was in the midst of the hardships and the vices of frontier life that Peter Cartwright passed his boyhood. The nearest mill was forty miles away, and corn was ground with pestle and mortar. A deerskin stretched over a hoop and perforated with the heated prongs of a fork constituted the sieve through which the meal was shaken when specially prepared for use. Schools were few, and these not worth the name. Churches were equally scarce, and by the greater part of the inhabitants Sunday was given up to dissipation and sport. Hunting, fishing, horse-racing, card-playing, and dancing were the Sabbath pastimes in most general favor. He describes himself as "a wild and wicked boy, delighting in horse-racing, card-playing, and dancing" (*Autobiography*, p. 27). His father did not care to restrain him, but gave him cards for gambling and a fast horse for racing. His mother talked with him and wept over him, her expostulations often melting him to tears. When nearly sixteen years of age he commenced to read the New Testament regularly; he burned his cards, gave back his race-horse to his father, and began a struggle with every sinful habit of his life. Months of darkness and distress followed. Some feared he would become insane, but his mother exhorted him to continue to pray. During the month of May, 1801, a sacramental meeting was held in a grove a few miles away, conducted jointly by Presbyterian and Methodist ministers. Thither young Cartwright went, and there became the subject of a change concerning which he says: "Divine light flashed all round me, unspeakable joy sprang up in my soul. I rose to my feet, opened my eyes, and it really seemed as if I was in heaven" (*Autobiography*, p. 37).

A little more than three years from this time, and while in his nineteenth year, Mr. Cartwright was received as a travelling preacher into the "Western Conference," so called, it being the only conference at that time west of the Alleghanies. The circuits of this conference extended from Detroit to Natchez, and as there were but thirty-six regular preachers in the whole territory, the dimensions of the charges can be easily inferred. The round of appointments on Cartwright's first field required not less than 600 miles of travel. After eight years of circuit work he was appointed by Bishop Asbury presiding elder of Wabash district, a district which then embraced nearly the same territory now included in two annual conferences. Of the sixty-five years of Mr. Cartwright's active labors, upwards of fifty were spent in the presiding eldership of different districts, the last forty-four years of his effective ministry being wholly employed in that office. In 1816 he was chosen a delegate to the General Conference which was soon to meet in Baltimore, Md., and from that time forward he was elected to a seat in thirteen General Conferences successively, his last appearance upon the floor of that body being in May, 1868.

Mr. Cartwright was of medium height, with a broad and muscular frame well suited to the pioneer-work to which he gave the greater part of his life. At three-score-and-ten he was described as "warworn and weatherbeaten. His complexion bilious, the integuments of his face wrinkled and tough, his eyes small and twinkling, his mouth compact and full of force, his head large and round, his forehead deeply indented."

His every movement, even in his old age, denoted energy. He had been drilled in the school of poverty till he called nothing hard. Accustomed to rough experiences and rough men, he undertook that which was difficult without hesitation, and possessed a courage which never feared the face of man. He was not learned in the schools, but he read men with the quickness of intuition. In conquering ignorant opposition, in putting scoffers to silence or shame, and in managing disorderly crowds at Western camp-meetings he had no equals in his time. He was sometimes rude, but always merciful. His wit was ready and keen, in debate he was pithy and humorous, his sermons were blows to right and left, and his rebukes the very besom of destruction.

The strongly-marked peculiarities of Mr. Cartwright in dealing with the characters and facts of those times have placed him in the foreground of not a few newspaper stories, of which he had no knowledge until their appearance in print. That he was sometimes eccentric to a degree not altogether to be admired, much less to be imitated, cannot be denied. But when the state of society in which his early life was spent is considered, many of his daring acts and the rough methods by which he carried important points become only an intense originality. (D. W. C. H.)

CARY, ALICE (1820–1871), an American authoress, was born near Cincinnati, April 26, 1820. She was descended from John Cary, who came to Plymouth colony in 1630 and taught the first Latin class there. Her grandfather, Christopher Cary, removed from New Hampshire to Cincinnati in 1802. She had but slight opportunity for education, yet she began to write poetry at the age of eighteen. She first attracted attention by sketches of rural life contributed to the *National Era* under the signature of "Patty Lee." In 1849 a collection of the *Poems of Alice and Phœbe Cary* was published in Philadelphia. In 1850 the two sisters removed to New York, where they henceforth lived, honored and beloved, maintaining themselves by literary labor. Although Alice in writing was "pensive and tender," and Phœbe "witty and gay," the former bore the chief responsibility of their household, and yet by her energy and industry contributed not less to various periodicals. In 1851 she published *Clovernook; or, Recollections of our Neighborhood in the West*, which was continued two years later in a second volume, and in 1855 in a third called *Clovernook Children*. *Pictures of Country Life*, 1859, was another volume of the same character. In 1852 she published *Hagar, a Story of To-Day*. Her other novels are

Married, not Mated, 1856, and *The Bishop's Son*, 1867. Her poems, drawn, like her prose writings, from her own observation of life and nature, are noted for their melody and grace. Edgar A. Poe pronounced her *Pictures of Memory* one of the most musically perfect lyrics in the English language. In 1853 she published *Lyra, and Other Poems*, which called forth severe criticism by their uniform sadness, but proved popular. To the second edition in 1855 she added *The Maid of Tlascala*, a long narative poem. In 1866 she published *Ballads, Lyrics, and Hymns*, consisting of her choicest poems, and in 1868 *The Lover's Diary*, a series of lyrics. After months of hopeless illness she died at New York, Feb. 12, 1871.

CARY, PHŒBE (1824–1871), an American poetess, sister of the preceding, was born near Cincinnati, Sept. 4, 1824. Like her sister, she became a frequent contributor to periodical literature. Her first volume was a collection of *Poems and Parodies*, published in 1854. Besides the volumes issued in the name of the two sisters, Phœbe assisted her pastor, Rev. Dr. C. F. Deems, in editing *Hymns for All Christians*, 1869, and composed several hymns for this volume. She also published *Poems of Faith, Hope, and Love*, 1868. Her hymn, *Nearer Home*, has been acceptable to Christians of all denominations. She did not long survive her sister, dying at Newport, R. I., July 31, 1871. The sisters left poems enough uncollected to furnish four or five volumes. Mrs. Mary Clemmer Ames published in 1873 a graceful tribute to these estimable writers in her *Memorial of Alice and Phœbe Cary*, and edited two volumes of their poems.

CASPARI, KARL PAUL, a German theologian, was born at Dessau, Feb. 8, 1814. He was educated at the universities of Leipsic, Berlin, and Königsberg, from the last of which he graduated in theology, and became in 1847 lecturer and member of the faculty of the University of Christiania, Norway. He gave there a course of theology and exegesis which had a great success and established his reputation as one of the most erudite and able theologians. In 1857 he was appointed professor of theology. He published *Exegetisches Handbuch zu den Propheten des alten Bundes*, in which he was aided by Delitzsch; *Biblisch-theologische und Apologetisch-Kritische Studien* (1842); *Beiträge zur Einleitung in des Buch Iesaius* (1848); *Ueber den Syrisch-ephraimitischen Krieg unter Jotham und Ahas* (1849); a translation of the Psalms into the Norwegian; *Micah and his Prophecy; Commentaries upon the Prophecies of Isaiah; Sources of the History of Baptism and of the Creed* (4 vols., 1866–79); and several works upon the Arabic language, including an Arabic grammar.

See Vol. V. p. 158 Am. ed. (p. 181 Edin. ed.).

CASS, LEWIS (1782–1866), an American statesman, was born at Exeter, N. H., Oct. 9, 1782. His father, Jonathan Cass, of Puritan descent, had enlisted in the Revolutionary army at the age of nineteen, and served through the war from Bunker Hill to its close, retiring with the rank of captain. In 1792 he joined the army under Gen. Wayne, was appointed major, and stationed at Fort Hamilton in Ohio. For his services he afterwards received a tract of land on the Muskingum River, where he settled in 1800.

Lewis, his eldest son, was educated at the famous Exeter school, under Benjamin Abbott, until he was seventeen, when his father started with his family on a tedious journey to Ohio. While they tarried at Wilmington, Del., Lewis taught in a school, and at Marietta, Ohio, he began the study of law with Gov. Return J. Meigs. At the age of twenty he was admitted to the bar, and began to practise at Zanesville. In 1806 he was married to Elizabeth Spencer, and in the same year was elected to the legislature. When President Jefferson called attention to the movements of Aaron Burr on the Ohio River, Mr. Cass introduced a bill conferring power on the governor to arrest all concerned in the affair, and in consequence Burr's boats and stores were seized. He also drafted a complimentary address to the President, which was adopted by the legislature, and Jefferson soon after appointed him United States marshal for Ohio, which position he held till 1813.

When war with Great Britain was threatening in 1812, Cass raised a regiment of volunteers, and marched 200 miles through the wilderness to Detroit, expecting to unite with other forces under Gen. Hull for the invasion of Canada. But as the British had been informed of the declaration of war sooner than Hull, they had already seized the fort at Michilimackinac, and thereby secured the alliance of the Indians. A council of war was held, and Col. Cass urged a forward movement, while Gen. Hull, distrusting the militia, hesitated, but finally consented. The army crossed the Detroit River July 11, Cass being the first to land in Canada. A proclamation written by him was issued, assuring the inhabitants of protection, but declaring that no quarter would be given to those found fighting in company with Indians. Col. Cass had taken a position some distance in advance, when Gen. Hull, finding his force outnumbered, and fearing that the Indians would be let loose upon the Territory, surrendered to Gen. Brock. Col. Cass, released upon parole, hastened to Washington and indignantly denounced Hull as a traitor. As soon as an exchange was effected, Cass was commissioned as colonel in the regular army, and raised a regiment in Ohio. He joined the army under Gen. W. H. Harrison, was promoted brigadier-general March 12, 1813, took part in the campaign in Canada, and after the recapture of Detroit was appointed by President Madison governor of the Territory of Michigan. At his suggestion a scientific exploring expedition was sent under his command to the shores of Lake Superior. Mr. Henry R. Schoolcraft, who accompanied the expedition as mineralogist, published a full account of it in his *Travels from Detroit to the Sources of the Mississippi*. Gov. Cass administered the affairs of Michigan with energy and success for nearly eighteen years, assisting immigration and developing the resources of the country. In 1815 he had purchased for $12,000 a tract of 500 acres in Detroit, which became in the course of time immensely valuable.

In August, 1831, he was appointed by President Jackson Secretary of War, and during his administration conducted the Black Hawk war and gave instructions to Gen. Scott during the Nullification troubles in South Carolina. He also enforced the removal of the Indians from the State of Georgia to the territory west of the Mississippi. This policy, though insisted upon by the whites of Georgia, was in violation of the treaties with the Indian tribes, and led to the bloody and expensive war with the Seminoles. In 1836, Gen. Cass resigned his position on account of failing health, and was appointed minister to France, with permission to spend some months in travel. Immediately upon his arrival at Paris by vigorous measures he secured the payment to the United States of interest amounting to $5,000,000 on the claims of indemnity for French spoliations committed in 1798. In the spring of 1837, Gen. Cass embarked at Marseilles on the United States frigate Constitution, and spent eight months in visiting the countries on the shores of the Mediterranean. Returning to France, he resumed his duties, and especially enjoyed familiar intercourse with King Louis Philippe, whom he sketched in pleasing colors in his work on *France, its King, Court, and Government*, 1840. Great Britain, having emancipated the slaves in her dominions in 1837, had for some time been urging upon other leading nations the suppression of the African slave-trade, and for this purpose she proposed in 1842 to Austria, Russia, Prussia, France, and the United States what was called the Quintuple Treaty. This was strenuously opposed by Gen. Cass, on the ground that it involved the right of maritime search, to which the United States had always objected. He published an elaborate address to the French people on the subject, and to his efforts it was due that France and the United States refused to join in the course proposed. Subsequently, when the Ashburton treaty was negotiated by Daniel Webster, then Secretary of State, Gen. Cass, thinking the position he had taken not properly sustained, engaged in a controversy with the secretary, and in September, 1842, was recalled.

He returned to Michigan, and in 1845 was elected to the United States Senate, where he supported President Polk's policy and opposed the Wilmot Proviso, on the ground that Congress had no power to exclude slavery from the Territories. This view he fully set forth in a celebrated letter to Mr. A. O. P. Nicholson of Tennessee, dated Dec. 24, 1847. In 1848 he was nominated by the Democratic party for the Presidency, but was defeated by Gen. Zachary Taylor, the Whig candidate, who received 163 electoral votes from fifteen States, while Gen. Cass received 127 electoral votes from the same number of States. Pending the election, he had resigned his seat in the Senate, but was afterwards re-elected by the legislature of Michigan, and in 1851 was again elected to that position. In 1852 he was a prominent candidate before the Democratic convention, but after several days' balloting the choice fell on Franklin Pierce. In 1854 he voted for the Kansas-Nebraska bill. In 1856, Gen. Cass declined to be a candidate for the Presidency, but supported Mr. Buchanan as the Democratic nominee, and after his election was called to be Secretary of State. When the Southern States passed ordinances of secession, he agreed with President Buchanan in denying that the Federal Government had constitutional power to coerce a State. In December, 1860, he resigned on account of Mr. Buchanan's opposition to the reinforcement of Fort Moultrie at Charleston, then threatened by the secessionists of South Carolina. He returned to Michigan, and henceforth held no public position. though he declared his sympathy with the war for the Union. He died at his home in Detroit, Mich., June 17, 1866.

He published in 1823 *An Inquiry respecting the History, Traditions, Language, etc. of the Indians Living in the United States.* He also contributed to the *North American Review* some articles on Indian affairs, and published several historical and scientific sketches and addresses. His *Life* was written in 1848 by H. R. Schoolcraft, and in 1856 by W. L. G. Smith.

CASSEL, Paulus Stephanus (originally **Selig**), a German theologian and author, was born in Grossglogau, Silesia, Feb. 27, 1827, of Jewish parents. He was educated at Schweidnitz, and afterwards studied at Berlin, devoting himself especially to history under Prof. Ranke. From 1850 to 1856 he was editor of a newspaper at Erfurt. In 1855 he was converted to the Christian faith, and for three years had charge of the royal library at Erfurt, being also secretary of the academy there. In 1859 he removed to Berlin, and in 1866 was elected to the Prussian Parliament. He acted with the conservative party, and afterwards declined a renomination. He was appointed a preacher in Christ Church, Berlin, where he has since labored with great success, having a Sunday-school with 1000 scholars. In 1869 he delivered a series of discourses on the Roman councils and the history of the papacy which attracted much attention, and in the following year his *German Discourses*, referring to the war with the French, had equal success. He has since been invited to preach in most of the large German cities, and has received the degree of doctor of theology from the evangelical faculty of Vienna. During the anti-Semitic agitation in Berlin he was the only evangelical clergyman that openly defended the proscribed class. His published works are numerous and embrace a great variety of subjects. Among those relating to history are —*Magyar Antiquities* (*Magyarische Alterthümer*), 1848; *Studies in the Edda* (*Eddische Studien*), 1856; *The Tri-lingual Sardinian Inscription*, 1864; *Thrones in History, Symbol, and Legend* (*Kaiser- und Königsthrone in Geschichte, Symbol, und Sage*), 1874; *The Origin of the English* (*Die Abstammung der Engländer*), in which he refutes the notion that the English are derived from the ancient Israelites; *The Jews in History* (*Die Juden in der Weltgeschichte*). Some of his political writings have an interest beyond the occasion which called them forth; for instance, *From Warsaw to Olmütz* (1851). As a theologian he is thoroughly evangelical, and has prepared commentaries on *The Books of Judges and Ruth* (1865) for Lange's great work, and later on *The Book of Esther* (1880). He has written a very full account of the observance of Christmas (*Weihnachten, Ursprünge, Bräuche, und Aberglauben*, 1862), maintaining its original Christian character and its connection with ancient Jewish customs, while strongly opposing the view that it had its origin in a pagan celebration of the winter solstice. He has also written on *The Gospel of the Sons of Zebedee* (1869) and *On the Way to Damascus: Apologetic Treatises* (1874). His latest theological work is *The Symbolism of Blood* (1882). He has also published for several years *Sunem*, a weekly theological and historical journal.

CASTELAR, Emilio, Spanish statesman and politician, born in 1832. He plunged at a very early age into Spanish politics. In the controversy between the Christinos and the Carlists a republican party sprang into being, and in this he placed himself. The popular insurrection of 1854 aroused all Spain, and Castelar, to give vent to the views of his party, established a journal called *La Democracia*, but with his politics there was mingled a strain of theological mysticism which displeased many of his fellow-democrats. He had not long before been appointed professor of history and philosophy in the University of Madrid, but, owing to his political views, he was deprived of his chair. In the important revolution of 1866, which was put down by Gen. Serrano, he took part, and was among the first to defend the barricade, but found himself abandoned by his lukewarm friends and obliged to fly for his life. He went first to Geneva, and then to France, and in his absence was condemned to death at Madrid. After the great revolution of 1868, which caused the abdication of Isabella II., he returned to Spain, and was one of the chiefs in the democratic movement. He proposed to the provisional government the formation of a republic, organized public meetings, and by his fiery speeches stirred the people against any new monarchy. Under the influence of his enthusiasm the democrats carried the municipal elections in December all over Spain except in Madrid, and Castelar was sanguine as to the result. But the tide was already turning. In the February following the general elections went against him, and he found himself in the Cortes the chief of a minority. His motion to declare a general amnesty for all political offences was defeated. He combated vigorously the proposition to create a regency, but he also refused to take part in a republican insurrection which broke out in October. For eighteen months he contested the schemes of the monarchists and opposed all their candidates for the throne, especially the duke of Aosta, the second son of Victor Emmanuel, who had been presented by Marshal Prim. A motion of censure which he proposed on Nov. 3, 1870, was lost by a vote of 122 to 44; but he maintained his opposition, even after the new king called Amadeus landed at Cartagena. When, after a brief trial, Amadeus abdicated the throne on the 11th of Feb., 1873, Castelar again gained influence; he was made minister of foreign affairs by a large vote, and in this capacity addressed a circular letter to the European powers, in which he declared the peaceful intentions of the republic and the loyal support of the army. Through his influence the resolution abolishing slavery in Porto Rico was passed, March 23, 1873. Soon after he addressed the Cortes in a speech of counsel and advice, and resigned his portfolio; but his services were needed, and he was declared the national executive. In this exalted post he set to work to bring order and lawful dealing into the democratic ranks, and to restore the discipline of the army. The revolutionary spirit was now rife throughout Spain; there were many parties, and the Cortes was in an uproar. He became involved in a quarrel with Señor Salmeron, the president of the Cortes, who demanded the restoration of two members of the council who had been suspended, the withdrawal of the nominations of certain bishops, and the retirement of certain generals. These Castelar refused, and on a test vote of 120 to 100 he was not sustained. He left Spain, and travelled in France and Italy, where he was everywhere received with the greatest distinction. Upon the *pronunciamiento* of Martinez del Campo the son of the deposed Isabella II. was proclaimed as Alfonso XII., and monarchy was again triumphant. Castelar returned to Spain and took his seat in the Cortes; he protested against the oath of allegiance, moved a resolution in favor of universal suffrage, combated the new constitution clause by clause, spoke often and earnestly in favor of religious liberty, declared that all mayors should be elected by the municipal councils, and urged that military service should be made obligatory. His published writings are mainly political orations and discussions, including a *History of the Republican Movement* in Europe (1875), a *Life of Byron* (1875), and *Parliamentary Speeches* (3 vols. 1871). His principal work is on *Art, Religion, and Nature in Italy* (1874). In 1879 he was elected a member of the Spanish Academy. (H. C.)

CASTELLIO (or CASTALIO), SEBASTIAN (1515–1563), was born at St. Martin du Fresne, then a village of Savoy, afterward of France. He was educated classically at Lyons, but never attended any university. In Strasburg he met with Calvin during the Reformer's temporary exile from Geneva (1538–41), and on his return to that city Castellio was called to the rectorship of the schools of Versonnex. But doctrinal differences between the two men, culminating in Castellio's rejection of the tenet of predestination, led to his dismissal in 1544. He proceeded to Basel, where he lived for several years in deep poverty, translating the Bible into Ciceronian Latin and into French, and depending upon work for the printing-offices. He set up a boarding-school for boys, and in 1552 became the professor of Greek in the city's university, and continued in this office till his death. His quarrel with the Genevese theologians continued, and led to an interchange of pamphlets, in which Castellio showed the best temper, and Beza, then at Lausanne, the worst. When Servetus was burnt for heresy in 1553, the Protestant theologians generally expressed their approval. But Castellio published, under the pseudonym "Martinus Bellius," a pamphlet in defence of the principle of toleration, containing testimonies of Luther, Brenz, and others adverse to the use of the civil power against opinion. It was translated from Latin into French, German, and Dutch. Beza replied, and the bitterness between the two increased. Castellio gave his enemies a handle against himself in 1563 by translating from the Italian Ochino's *Dialogue* containing a defence of polygamy. Beza, after securing from the senate of Basel an order forbidding him to defend in print his opinions on predestination, began a final onslaught on Castellio, which the latter understood to mean that he was to be dealt with as Servetus had been. Less than a month after replying to the written accusation sent to the senate from Geneva, he died, Jan. 4, 156¾, his troubles and anxieties contributing to his death.

Castellio is interesting as a theologian, as a humanist, and as the first champion of the principle of toleration. His opposition to Calvinism led to the name "Castellionist," having the same sense in his century that "Arminian" bore in the next. In all controversies he showed an amicable spirit, and an abstinence from personalities and abuse rarer in that age than in later times. His own views tended to mysticism; he translated into classic Latin the *Theologia Germanica* (Basel, 1557; 7th ed., Leipsic, 1730, ed. by J. G. Pritius) and the *Imitation* (*De Christo Imitando*, Basel, 1556; frequently reprinted). His Latin version of the Bible (Basel, 1551; 8th ed., Leipzic, 1750) was a careful and faithful rendering, but the medium was not chosen happily. His own opinions on controverted points are given in his posthumous *Dialogi Quatuor* (Basel, 1578; 3d ed., Frankfort, 1696). As a humanist he is commemorated by his editions of Thucydides, Xenophon (1555), Herodotus (1559), Diodorus Siculus (1559), and Homer (1561), and the *Sibylline Oracles* (1546). Jakob Machly's biography (Basel, 1862) supersedes all others. (R. E. T.)

CASTORIDÆ, a family of sciurine simplicident rodents, of which the single living representative is the BEAVER (which see), the so-called "fossil beaver" of North America being placed in a different family (*Castoroididæ*). There are, however, several fossil genera, as *Diobroticus* and *Stenofiber*, with probably *Trogontherium*, *Palæcastor*, and others. Referring to the article BEAVER, some technical characters of *Castoridæ* may be added. In the uro-genital system there is seen a relationship of a rodent family of placental mammals with the implacental marsupials, in that the organs open into a common cloaca. Weberian bodies are remarkably developed as a uterus masculinus: there are several associate glands, among them the "scent-bags" which secrete the commercial article known as castoreum; the stomach has a glandular appendage, and the salivary glands are enormously developed. The tibia and fibula unite below in old age, contrary to the rule in the sciurine series of rodents; still, it is not that true ankylosis which occurs in murine and leporine *Rodentia*. There is an accessory carpal ossicle; the clavicles are perfect. The skull is massive, without postorbital processes; the dentition powerful, with rootless or only late-rooting molars; *p. m.* $\frac{1-1}{1-1}$. The family nearest related to the *Castoridæ* among living rodents is the *Haplodontidæ*. (E. C.)

CATALANI, ANGELICA (1779–1849), a celebrated Italian singer, was born at Sinigaglia in 1779, or, according to others, in 1784. Her father, a magistrate of the town, being deeply religious, intended that she should lead a conventual life, and therefore sent her to the convent of Santa Lucia in the duchy of Urbino, near Gubbio. When about eleven years of age, her voice having attracted much attention from irreligious visitors, the bishop refused to let her sing solos in the chapel services, but only in concerted music with the other novices. On her health failing from over-study, she left the convent, and was fortunate enough to obtain instruction in music from Marchesi. Signor Catalani reluctantly consented to her becoming a public singer. She sang at the age of sixteen in the opera of *Lodoiska* at Venice, and in 1798 was heard throughout all Italy. In 1804 at Lisbon, and in 1806 in Paris, she appeared with success, and in the winter of 1806 made her first appearance in London in *Semiramide*. Here she remained until 1814, and then returned to Paris, where she conducted the Italian opera for four years, and lost large sums of money through the bad management of her husband, M. de Valabrègue, formerly a captain in the French army. She then made concert-tours throughout Europe, returning to England in 1821, and again in 1824. She retired from the lyric stage in 1831, and resided on her estates near Lake Como, where she founded a school for young girls, who paid no fees, but on graduating were obliged to adopt the name of Cruvelli. In the summer of 1849 she removed to Paris with her three daughters, but in a few days was attacked with cholera, and died June 12. She left an estate valued at 8,000,000 francs. Her eldest son became an equerry to Napoleon III.

Catalani's voice was a pure soprano of extremely large compass and power of tone, and she gained great applause by the brilliancy of her vocalization in rapid, florid passages. Her love of grace-notes and ornamentation made her specially welcome in the concert-room, where the power to create astonishment is always well rewarded. Even on the operatic stage she did not disappoint her admirers in this particular, but imitated the songs of birds and introduced rapid chromatic scales. Hence, artistically, she was not the equal of many singers of the time in sacred music or parts requiring great pathos. Her mental powers generally were not cultivated to the degree that her endowments merited, and hence her art, great as it was, failed to satisfy certain orders of minds. But when it is considered that to physical beauty, high animal spirits, equable temper, and artistic gifts Catalani added the utmost purity of soul, generosity, and warm affections, it will not be thought surprising that she was the idol of thousands of persons. (S. A. P.)

CATALPA. This American tree is, except the trumpet-vines *Bignonia* and *Tecoma*, the only representative in the United States of the large order *Bignoniaceæ*. In the earlier days of botany it was known as *Bignonia Catalpa*, and it is so described by Linnæus, but was separated by Jussieu, chiefly on account of its having a two-parted calyx, corolla with a ventricose tube and four-parted limb, two fertile and three sterile stamens, and the dissepiments of the capsule opposite the valves; while *Bignonia* has the dissepiments parallel with the valves, four fertile and one infertile stamen, the campanulate limb of the corolla of five unequal lobes, and the calyx nearly entire or with five small teeth. It was overlooked by the early American botanists, and seems to have been first noted by Catesby in South Carolina in 1728. The name "Catalpa" is said by some to be a corruption of Catawba, and applied to this tree because first found among the Catawba Indians; by others, that it was the name given by the Indians themselves to the tree. Of late years it has been discovered that the kind growing on the lower Mississippi is distinct from the species common farther East, and it is remarkable that the early French settlers associated this also with the Indians of that region under the name of *Bois Shavanon*, or the "Shawnee's Wood." The Eastern form is known as *Catalpa bignonoides*—the South-western as *C. speciosa*, so named by Dr. Warder from the larger and more showy flowers, which appear about two weeks earlier than the others. He first noted the difference between them in the *Horticultural Review* for 1853. Botanically, it is easily distinguished by the seeds, which have the fine cottony hair at the ends spread flat like a comb, while in the *Catalpa bignonoides* it is somewhat twisted together; the lower lobe of the corolla is notched, not entire, as in *C. bignonoides*; and the bark, smoothish and somewhat scaly in the latter, is usually deeply fissured in older plants of *C. speciosa*. The distinctions are important, as the South-western form is said to make a stem straighter than the other, and thus more desirable for timber-planting. In the North-west it seems to thrive a degree or so farther north than the Eastern species, and perhaps is adapted to timber-culture in Dakota or Minnesota.

The Catalpa has become very popular with forest-tree planters. Rafinesque, writing in the early part of the present century, notes that it was then famous for the durability of the wood, and the evidence for this good quality is overwhelming. G. W. Alves of Henderson co., Ky., reports that two kinds are distinguished in that region, the White and the Yellow Catalpa, and that the former endures as posts only from ten to twenty years. Posts of the Catalpa wood are known to be fifty or more years old, and so sound as to probably endure for a century. W. R. Arthur, in 1871 superintendent of the Illinois Central R. R., after careful tests extending over some years, reported the wood admirable for railroad ties; "though not retaining the spikes quite as well as oak, yet sufficiently well for all practical purposes." After full investigation other railroad officials have been satisfied of its great value for railroad purposes, and in 1879 the Fort Scott R. R. Company planted in Kansas 100,000 young trees as a future source of timber for their road. It bends before breaking more than oak or ash. Pieces an inch thick, one foot between supports, have not broken till under a pressure of 703 pounds—about the same in this capacity with oak and ash. The wood polishes well, and is extensively used in railway-car manufacture and by undertakers. It is a very light wood, comparing with ash in this respect. Besides the value of its timber, it has the advantage of rapid growth. In the courtyard of Washington, Ark., are trees of the *C. speciosa* brought from the Red River in 1840, two of which measured, in 1881, 11¼ and 10½ feet round four feet from the ground. The same species in Central Ohio has grown large enough in five years from the seed to be used for posts for wire fences. Dr. Warder notes a tree at Terre Haute, Ind., fifteen years planted, which had grown to 21 inches in diameter. Many large specimens of the Eastern species have been reported. Along the Catawba River in North Carolina, where they were first observed by Catesby in 1726, the writer of this has measured them 50 feet high and about six feet in circumference as the average mature size about four feet from the ground. Lower down they are often very thick. One in Fairmount Park, Philadelphia, is 13 feet at one foot from the ground. One in Washington Square, Philadelphia, planted in 1816, was 8 feet in circumference 4 feet from the ground in 1880. The writer saw a tree cut down at twenty-five years of age which was 18 inches across. The timber is very poor for fire-wood, igniting badly and smoking away. No insect is known to prey on it.

Considerable interest has been manifested in the geographical distribution of the Catalpa. The earliest observers, like Nuttall, believed it "to have been introduced by the aborigines," and perhaps this impression suggested the common Indian name by which it is known. The Catawba Indians, however, are believed to have travelled from northern regions to South Carolina, and the tree is not indigenous north to any extent, though a few scattered trees are found up to the Canadian line. The Shawnees also came down from Wisconsin and other Northern States, and could not have brought the tree with them. It could not have been brought from Japan, as, though two small-growing species are there indigenous, they are unlike either of the two American kinds. The Catalpa is rarely found in forests, but this may be owing to taller-growing trees, through the long ages, crowding out the smaller light-loving species, which, in the struggle for existence, had to take to open places in alluvial bottoms or along river-banks in order to live at all. Its whole character indicates a relationship with a very old race which has barely been able to sustain itself against the incursions of newer forms. The flattened lobes of the stigma, as well as those of the Bignonia, are sensitive, and close slowly on being touched, indicating in this respect some relationship with *Mimulus*, *Torenia*, and others in the order *Scrophulariaceæ*. (T. M.)

CATASAUQUA, a borough of Lehigh co., Pa., is on the E. bank of the Lehigh River, 3 miles above Allentown and 60 miles N. N. W. of Philadelphia, on the Lehigh Valley Railroad, the New Jersey Central Railroad, and the Catasauqua and Fogelsville Railroad. The river is here crossed by railroad and other bridges. It has a national bank, seven hotels, two weekly newspapers, nine churches, and fourteen schools. It has the extensive Crane iron-works, rolling-mills, Lehigh car-works, two foundries, and a fire-brick works. It has gas- and water-works. Its public debt is $39.000, and its yearly expenses $8500. It was settled in 1839 and incorporated in 1854. Population, 3065.

CAT-BIRD, a small oscine passerine bird, the *Mimus* (*Galeoscoptes*) *carolinensis*, of the sub-family *Miminæ*, which includes the mocking-bird, and is now commonly referred to the thrush family (*Turdidæ*), though it has some evident relationship with the wrens (*Troglodytidæ*). The species of *Mimus* are numerous, but the present one is the only representative of the section *Galeoscoptes*. The cat-bird inhabits the United States and a portion of British America, but especially the regions east of the Plains; also Mexico, Central America, and the Bermudas in winter. It is an abundant and familiar inhabitant of shrubbery and undergrowth of all kinds, and derives its common name from the singularity of its note of alarm or displeasure, which resembles the mewing of a cat. But it is also a fine songster, ranking with the thrasher or brown thrush (*Harporhynchus rufus*) and other members of *Mimus* and related genera. The nest is constructed of twigs, bark-strips, leaves, and grasses, and placed low in a bush; the eggs are four to six in number, deep greenish-blue, not spotted. The length of the bird is about 8¾ inches; extent of wings, 11 or more; wing, 3¾; tail, 4; bill, ¾; tarsus, 1. Contrary to the rule in *Miminæ*, the tarsal scales are sometimes obsolete, as in the true thrushes. The color is slate-gray, paler below; the crown of the head, tail, bill, and feet black; the wings blackish, edged with the body-color; the under tail-coverts chestnut, forming a conspicuous mark. The general form is that of a mocking-bird. The cat-bird is chiefly insectivorous, but also feeds much upon berries and other soft fruits; it is a migratory species, breeding throughout its United States range, but resident in the Southern States and beyond. Its abundance and familiarity too often bring it into undeserved contempt; it is a useful bird to the agriculturist, and its musical ability is of a very high order. (E. C.)

CATHARTICS. Cathartics are remedies which are employed for the purpose of provoking discharges from the bowels. They are divided into laxatives, purgatives, hydragogues, and drastics. A laxative is a substance which is used solely for the purpose of provoking alvine discharges a little looser than natural. A simple purgative is one which acts decidedly, but not very violently. A hydragogue is a remedy which produces very free watery discharges. A drastic is one which irritates very greatly the bowels.

Laxatives act in two ways: first, by a direct action which they exert upon the intestine; and secondly, by means of their bulk. It is a general rule that all foods which contain a large amount of waste material have a tendency to produce looseness of the bowels. It is well known, for instance, that in herbivorous animals the stools are habitually soft, whilst in Carnivora constipation is the rule. Consequently, cracked wheat, unbolted flour, and oat-meal are much more laxative than the ordinary form of flour, because the latter has been deprived of its non-nutritious bran, and the bran itself has a more decided laxative power than even the cracked wheat. Vegetables, for the same reason, are much more laxative than meat. Fruits, both dry and fresh, act in great measure by the amount of residue in them, but in most cases have also a direct influence upon the intestine. Sugar, molasses, and other saccharine materials contain no waste material, but are laxative on account of a direct influence which they exert upon the alimentary mucous membrane. Milk contains, practically, no material which is not applicable to the needs of the economy, and leaves therefore no residuum in the intestine. When properly digested, it is consequently one of the most constipating of all articles of diet. This influence is intensified by removing the butter in the form of cream or by boiling the milk, since even the blandest oleaginous substances have some laxative power.

In all cases of constipation it is much better to regulate the bowels, if possible, by altering the diet and by attention to the habits of the patient than by the use of medicines, as even the best selected laxatives are prone to lose their influence, so that continually-increasing doses are required. But a great deal can be done in these cases by determined effort on the part of the patient to have a stool at a certain time every day. Unfortunately, many articles of diet which are laxative are at the same time of difficult digestion, and care is often necessary lest the dyspeptic patient be as much injured in one way as helped in another by a change of food. In very many instances the habitual use of enemata suffices, and is preferable to the continual taking of drugs. In selecting the time of defecation the person suffering from habitual constipation should be guided largely by the exigencies of his individual life, although (*cæteris paribus*) after breakfast is preferable. Nothing should be allowed to interfere with retirement at the time determined upon each day, and when the natural effort fails an enema should be resorted to—a pint to a pint and a half of cold water being used. Very frequently drinking a full tumbler of water immediately upon getting out of bed has a most happy effect.

When laxatives are habitually required, it is usually better to employ a saline, as Rochelle salts or one of the natural waters. In all cases the saline should be taken largely diluted, and before or just after the patient leaves the bed in the morning. As a substitute for the saline, or to alternate with it, an excellent laxative pill may be made by mixing 1 grain of aloes, 1 grain of the compound extract of colocynth, and ⅓ of a grain of extract of belladonna. It is very important that persons who are habitually constipated should avoid proprietary pills, because many of these contain mercury, and no confidence is to be placed in statements as to their ingredients.

The *purgatives* ordinarily in use are castor-oil, rhubarb, senna, colocynth, aloes, podophyllin, and the salines. Of these castor-oil is prominent as being non-irritating, whilst to the resin of podophyllum are commonly ascribed peculiar powers over the liver.

The *hydragogue cathartics* largely employed are elaterium and jalap, whilst croton-oil may be taken as the type of the drastics. A hydragogue cathartic is used especially in cases of dropsy when it is desired to cause absorption of collections of fluid by emptying the blood-vessels of a considerable portion of the watery constituents of the blood. A drastic is employed when it is justifiable to irritate the intestinal tract in order to relieve, on the principle of counter-irritation, some more vital organ, such as the brain.

If dangerous hypercatharsis be produced by an overdose of one of these remedies, the patient should be put to bed and absolute quiet strictly maintained. A large mustard poultice should be put upon the abdomen, of sufficient size to cover the whole of it, and opium should be freely exhibited. The opiate should always be in the liquid form, so as to secure promptness of action. In some instances, hypodermic injections of morphia have been used with benefit. When the drug taken has been free from irritant properties, large doses of aromatics with chloroform may be administered with great advantage. (H. C. W.)

CATHARTIDÆ (Gr. καθαρτής, a purifier, scavenger), a family of American vulture-like birds of prey, constituting the sub-order *Cathartides* of the order *Raptores*. These birds were long classed in a family, *Vulturidæ*, with the Old-World vultures, but are so widely different from the latter (which belong with ordinary hawks in the family *Falconidæ*) as to require not only a family, but also a sub-order, to be constituted for their reception. The head and often much of the neck is bare of feathers; the very large nostrils are perforate; the bill is comparatively weak, and little hooked, contracted at the base; the eyes are flush with the side of the head, having no superciliary shield; the wings are very long, ample, and strong; the powers of flight are unsurpassed. The feet are formed as in gallinaceous rather than in raptorial birds, with a short elevated hallux, long front toes webbed at base, and comparatively weak claws. There are various anatomical characters, among them absence of cæca and syringeal muscles. On the wing the *Cathartidæ* are graceful in the extreme, circling high and for indefinitely protracted periods without visible motion of the wings, and they walk on the ground better than most *Raptores*. They are voracious and indiscriminate carrion-feeders, filthy in habits to the last degree, and their ordinary means of defence is by vomiting the putrid contents of the crop. But these foul and ill-smelling birds are among the most serviceable of all to man, acting as efficient scavengers in warm countries where men could scarcely dwell were it not for their good offices. They seldom attack animals capable of offering decided resistance, but frequently destroy those which are sickly, disabled, or new-born. There are only six or eight species, referable, however, to five genera. The great Andean condor (*Sarcorhamphus gryphus*) is perhaps the largest and most notable of these, its nearest ally being the king vulture (*Gyparchus papa*), the range of which probably extends a little north of Mexico. The well-determined United States species are three, of as many genera: (1) The Californian condor (*Pseudogryphus californianus*) inhabits the Pacific coast of the United States. It is scarcely or not inferior in dimensions to an average condor, in stretch of wings at any rate, these being some 4 feet long and about 9 in extent, the wing from the carpal-joint, 2¾ feet; the tail, 1¼. Most of the neck as well as the head is naked, the plumage commencing with lengthened lanceolate feathers, which continue on the breast. The color is blackish-brown, with gray and white on the wings; the head bright-colored; the iris carmine. (2) The turkey-buzzard (*Cathartes aura*) is widely distributed from British throughout North, Central, and South America, and in most localities abundant. This is about 2½ feet long and 6 in extent of wings; the bill is white, the head red; the feet pale-reddish; the eye brown; the plumage blackish-brown, the long quills ashy-gray on the under surface. The plumage begins evenly all around the neck. This is the large dark bird so frequently observed sailing high over head with motionless wings, the tips of the longest quills bent upward and spread apart like fingers. It nests on the ground or on stumps and logs, laying two eggs, which are white, blotched with dark brown and neutral tints. (3) The carrion crow or black vulture (*Catharista atrata*) is practically confined to the Southern States and warmer parts of both Americas, in some cases frequenting the towns and becoming almost domestic. It is smaller in linear dimensions than the turkey-buzzard, but heavier-bodied; length about 2 feet; wing, 16 inches; tail, 8 inches. The head is dark-colored, not red, and the feathers run up to a point on the nape; the plumage is blackish, the wing-quills pale underneath and almost whitish toward their ends. The mode of flight is peculiar, as the species can sail no great distance without flapping the wings, and the general aspect during flight is strikingly different from that of the turkey-buzzard. The additional species of the family which have been described resemble one or the other of the two last, and do not appear to be determined with precision. (E. C.)

CATSKILL, the county-seat of Greene co., N. Y., is on the W. bank of the Hudson River, at the mouth of Catskill Creek, 115 miles N. of New York and 35 miles S. of Albany. Here the New York, West Shore, and Buffalo Railroad and the Hudson River Railroad connect with the Catskill Mountain Railroad. There is also daily communication with New York by steamboats. The town has a court-house, two national banks, nine hotels, two weekly and one daily newspaper, seven churches, an academy and other schools. The industries of the town comprise woollen-mills, flour-mills, planing-mills, machine-shops, paper-mills, stone-yards, and ice-houses. From the mountain-summit in the western part of the town there is a view of the Hudson River Valley for sixty miles. Population of the town, 4320.

CATTLE. See NEAT CATTLE.

CAUCUS, a political term applied to a meeting of citizens held for the purpose of securing concert of action at an approaching election. Until the opening of the American Revolution such meetings were entirely spontaneous and unofficial. From that time until about 1830 they tended more and more to become an official part of party machinery, and were regulated to a considerable extent by their respective parties. Since 1830 nominating conventions have taken their place, and caucuses have again assumed their original unofficial character.

I. The ante-Revolutionary origin, and even the derivation, of the word are uncertain. Gordon, as cited below, dates its origin to about 1720, and ascribes it to the father of Samuel Adams and some twenty others who were accustomed to meet together in order to decide on a ticket for a coming election. He notes the fact that some of them were "from the north end of the town, where all the ship-business is carried on;" and Boston tradition gives "the caulkers' club" as the original term of which *caucus* became the corruption. In 1763 the caucus had become a recognized political instrument in Boston, and John Adams mentions in his diary that here "selectmen, assessors, collectors, wardens, fire-wards, and representatives are regularly chosen before they are chosen in the town." The growth of the difficulties which led to the Revolution at once developed a general practice of holding caucuses. Throughout New England, where the towns were the unit of government, the caucus was the natural development of the town-meeting, and was always managed in much the same way; but it took on a distinct revolutionary character from the beginning of forcible resistance, and became really a town-meeting from which "disaffected persons" could be excluded. After 1775 the committees of correspondence appointed by the caucuses became the practical governing bodies of the towns until success was assured. In the Middle States, where there was no such unit of government as the town, the committees of correspondence were revolutionary from the beginning, and so continued until the new State governments assumed control of affairs: in some cases they were self-appointed and acted by common consent; in others, they were appointed by caucuses. In the Southern States the militia "company districts" were a passable substitute for the New England town system, and gave the committees of correspondence something of a representative character. In all the States the emphatic declaration of John Adams, that "our Revolution was effected by caucuses," was justified; and at the close of the Revolution the caucus had become a familiar political instrumentality. The fact that there was now but one political party in the country only made the caucus politically omnipotent.

For the operations of the caucus and committees in New England see 2 John Adams's *Works*, 144; 4 *ibid.*, 34; 6 *ibid.*, 468, 542; 1 Wills's *Life of Samuel Adams*, 509; 2 *ibid.*, 62; 1 Gordon's *History of the American Revolution*, 365; Frothingham's *Rise of the Republic*, 284, 312, 327; 1 Austin's *Life of Gerry*, 299, 390; 6 Bancroft's *United States*, 429. In the Middle States, see 1 Sparks's *Life of Gouverneur Morris*, 22; Jones's [Tory] *History of New York during the Revolutionary War*. In the South the work may be best seen by the proceedings of the so-called "Declaration of Independence" by Mecklenburg co., N. C., May 20, 1775; see J. S. Jones's *Defence of the Revolutionary History of North Carolina*, 203; Cook's *Revolutionary History of North Carolina*; Niles's *Principles and Acts of the Revolution*, 132; 1 McRee's *Life of Iredell*, 256.

II. The outbreak of party feeling which soon followed the inauguration of the Government under the Constitution in 1789 brought caucuses into a new prominence. All the State legislatures were now divided, at first into Federalists and Anti-Federalists, and after 1791 into Federalists and Republicans (or Democrats), and caucuses of the members of the respective parties, in order to secure concert of action in the election of United States Senators or State officers, at once became a feature of party warfare. In such caucuses party lines were usually drawn very distinctly. Outside of them no attempt was made to regulate or control the membership of any caucus which saw fit to meet and nominate candidates. As a general rule, the warm political feeling of the time was a sufficient safeguard against any uncertainty as to caucus membership, but some curious anomalies occurred: as an instance, the names of both Alexander Hamilton and Aaron Burr are on the executive committee of the Federalist caucus in New York City, Feb. 11, 1789, to nominate a candidate for governor. In Congress the supremacy of the Federalists was hardly challenged until 1793, so that caucuses were unnecessary. After that year they were undoubtedly held, though we find no record of them for some years. They were probably unofficial, after-dinner gatherings. Washington's refusal to accept a third term of office in 1796 brought into existence the curious nominating body known as the Congressional caucus. Until 1804 the electors voted each for two persons for President: he who received the highest number of votes became President, and he who received the next highest number became Vice-President, though no Vice-President had been voted for. In 1796, John Adams had been Vice-President for eight years, was the representative man of New England whose support was a necessity to the Federal party, and was in the direct line of succession to the Presidency. But he was no favorite out of New England, and there was a general agreement among Federalist Congressmen that Thomas Pinckney of Maryland, their alternate candidate, should receive universal support. The hope seems to have been that the agreement would be kept in New England as to Pinckney, and violated elsewhere as to Adams, so that the former would become President and Adams remain Vice-President. A similar arrangement, to keep the vote for Jefferson and Burr equal, was made by the Democrats, but the motive in this case seems only to have been a desire to prevent possible Northern jealousy of Jefferson. The agreement was not kept by either party. Both Pinckney and Burr were so far shelved by their respective party electors that Jefferson passed them and became Vice-President. During his term of the Presidency Adams became still more disliked by Federalists outside of New England. They therefore chose Charles Cotesworth Pinckney of South Carolina, a universally respected leader, as their alternate candidate, and formally renewed the agreement of 1796 at a caucus of Federalist Congressmen held in Feb., 1800. The Democrats imitated this proceeding; and ever since that time the electors have been a complete nullity in the American system. Instead of exercising any choice, they have only registered faithfully the choice already made for them by other bodies.

The first effect of the new Congressional caucus system was evil. All the Democratic electors, 73 in number, voted for Jefferson and Burr, and thus neither was elected, though each was superior to his Federalist rivals. The Federalists, 65 in number, all voted for Adams and Pinckney, with a single exception: one Rhode Island elector voted for Adams and John Jay; so that Adams had 65 votes and Pinckney 64, and the 8 votes of South Carolina, if they had been cast for them, would have seated them both without difficulty. The House of Representatives, voting by States, was now to choose between Jefferson and Burr for President. The Federalists, who controlled the House, preferred Burr, partly to baulk the evident desire of their opponents for Jefferson, and partly because they regarded Burr as the less dangerous of the two men. Eight States voted for Jefferson, six for Burr, and two were divided; so that there was still no election. The balloting continued for a week in secret session, with frequent caucuses of both parties; and the Federalists were charged with a design to prolong the deadlock until after March 3d, and then, there being no President, to force some extra-constitutional compromise. But Bayard of Delaware and a few other Federalists had agreed not to allow the balloting to be prolonged to any dangerous extent, and on the thirty-sixth ballot, Feb. 17, 1801, three of them refused to vote; this gave Jefferson ten States, and made him President. From this time the Democratic nominations were made by Congressional caucuses—Feb. 29, 1804, Jan. 23, 1808, May 18, 1812, and March 16, 1816. The only Congressional opposition was in 1808, when Randolph and others of Monroe's friends protested against Madison's nomination by a caucus; and in 1816, when Monroe was nominated by 65 votes, to 54 for William H. Crawford of Georgia. But in May, 1812, the Democratic caucus of the New York legislature revolted and nominated De Witt Clinton against Madison, and in September a caucus of Federalist leaders met in New York City and indorsed Clinton's nomination. With this exception the Federalist caucuses were too informal for record. In 1820 a Democratic caucus was summoned, but was abandoned by common consent, and Monroe and Tompkins were re-elected without the formality of a nomination. All this time new States and new leaders had been growing up, and when the "Virginia dynasty" died out with Monroe's second term, there was an inevitable struggle between the official managers of the Democratic machine, represented by Crawford, and the newer interests, represented by John Quincy Adams, Henry Clay, and Andrew Jackson. Crawford's supporters endeavored to follow out the "regular" method of a nomination by Congressional caucus, but only 68 of the 258 members attended. The rest, friends of the other three candidates, declared war on "King Caucus" and trusted to nominations by State legislatures. In his death, as in his birth, the doomed potentate made trouble. There was no choice by the electors, Jackson receiving 99 votes, Adams 84, Crawford 41, and Clay 37. The House, voting by States, was now to choose between the three highest on the list, and it chose Adams by a vote of 13 States, to 7 for Jackson and 4 for Crawford.

Throughout the lifetime of the Congressional caucus legislative caucuses had been in steady operation. They were open to the same objection as their Washington rival: all the Democrats in a Federalist district were necessarily excluded from participation in the nominating body, and *vice versâ*. Various correctives were applied, the most radical and effective usually being a counter-nomination by dissatisfied or unrepresented constituencies. Sometimes the caucus itself added to its address, besides the names of its members, the names of certain "citizens who happened to be present" from various parts of the State. In 1817, in New York, the supporters of De Witt Clinton for governor, fearing that the Tammany-men, or "Bucktails," would control the legislative caucus, chose delegates in the counties represented by Federalists, and these delegates were allowed to vote in the caucus as if they were members. But this, though the germ of future "State conventions," was an isolated case. Nevertheless, as we approach the year 1824, we find legislative caucuses more and more indisposed to make their existence and actions offensively prominent, and more and more disposed to claim that their members in making nominations were acting "in their private capacities only."

A fuller account of the proceedings of the Congressional caucuses will be found in 25 Niles's *Weekly Register*, 244, and in Hildreth's *United States*, at the respective dates named. In regard to legislative caucuses Hammond's *Political History of New York*, and Niles's *Register* in its constant accounts of the proceedings of those bodies, have been followed.

III. The year 1824 marks the extension of the democratic idea to nominating conventions in the States. Such representative bodies had long been common in all the States for the nomination of members of the legislature and local officials, though the membership was very loosely guarded. Now, for the first time, the idea of extending them into State conventions seems to have arisen. At first it was warmly opposed. A committee of the Pennsylvania legislature early in Jan., 1824, remarked that "until lately the right of a citizen holding a legislative trust to express his opinion on public concerns was scarcely questioned; to maintain this principle seems to have become a serious duty, and firmly to adhere to the example set by those who have gone before." Nevertheless, on the 10th of the same month the legislative caucus recommended a State convention of delegates to nominate electors. With this step the rule of the legislative caucus was at an end. In New York the friends of De Witt Clinton, in a minority in the legislature, called a delegate convention at Utica for Sept. 21, 1824. This body condemned the nomination of candidates for State officers by members of the legislature. In Oct., 1826, the anti-Clinton, or "Regency," Democrats imitated their opponents and held a State convention at Herkimer. From this time the new convention system became universal in State politics. Legislative caucuses never have fallen into disuse, but their purpose has always been to nominate candidates for offices to be filled by the legislature or to agree upon proposed legislation. In the election of United State Senators the whole contest comes in the caucus of the dominant party: when that is decided the election is practically over, unless the minority of the caucus should take the not very common course of "bolting" the nomination.

The breakdown of the Congressional caucus in 1824 left the parties without a nominating body for presidential elections. Larger interests now controlled the country than could be bounded by the national capital; and yet these new interests had not yet learned how to use their powers. At first the result was an increase, though only temporary, of the influence of legislative caucuses, for these bodies willingly assumed the functions of the defunct Congressional caucus. Indeed, they had usually preceded the Congressional caucus in nominating heretofore. But then their action was tentative only, and intended to be ratified or rejected by the final nominating body: now their action aimed to be final, and the election of 1828 was managed altogether on nominations by State legislatures. But before there could be any exploitation of this political method the democratic idea in nominations had expanded at last to national proportions. The first step was taken by the ANTI-MASONS (see that title). Their weakness in the New York legislature had from the beginning divested them of any reliance upon a legislative caucus, and compelled them to use delegate State conventions; and the same reason now drove them into holding a national convention. In Sept., 1830, a deliberative Anti-Masonic convention met at Philadelphia. Its principal business was to summon the first national nominating convention, which met at Baltimore Sept. 26, 1831. The "National Republicans" (see WHIG PARTY) held their first convention at the same place, Dec. 12, 1831; and the Democrats at the same place, May 22, 1832, for the nomination of a Vice-President, Jackson's candidacy for the leading office being based on common consent or on nomination by State legislatures. Thereafter national conventions became the invariable rule for presidential nominations, and Baltimore the usual place for holding them on account of its neighborhood to Washington and convenience for Congressmen who had been appointed delegates. The Cincinnati Democratic convention in 1856 was the first occasion on which that party broke away from Baltimore as a convention city.

All the parts of a modern party oganization were now at last in existence, and it remained only to combine them. This was done during Jackson's second term (1833–37), not by Van Buren alone, but by a school of politicians at whose head he stood. The main course was in the organization of the lower, or primary, political units. The State and national conventions had come into existence almost full armed; but the district, county, and ward conventions remained generally in their original condition, unregulated by party law, and rather caucuses than conventions. The means to cure these defects was found in the following general method of procedure, which was fully introduced at this time, though traces of its fundamental idea are visible before: (1) Instead of leaving the call of a succeeding convention or caucus to chance or individual action, a standing committee was appointed at each convention to call its successor and to act in the interim as an executive committee. The conventions thus became continuing bodies, and the committees the motive-power; and on this latter foundation all modern party machinery depends. (2) The national convention decided the regularity of State conventions or committees, and the State conventions the regularity of subordinate conventions or committees. The whole thus became a homogeneous force. (3) Instead of paying the committees in money, the offices of the civil service, both of the States and of the nation, were used for that purpose. Removal from them served also as a means of party discipline. Of course the opposition party could not, like the dominant party, so use the offices *in præsenti*, but a distribution *in prospectu* was almost as effective.

All this new system inured only to the benefit of party-leaders and of the small politicians who supported them: the people had no share in the spoils, and no prospect of any. But it made the party which first adopted it almost irresistible. The "discipline" of the Democratic party became the characteristic most bitterly noticed by its opponents, and its first great defeat in 1840 was caused in no slight degree by the popular restiveness under an unaccustomed bridle. Within a very few years, however, Issachar had learned to bear his load uncomplainingly, and every succeeding party has adapted its methods to the general plan worked out from 1833 to 1837. At the present writing (1882) it seems impossible to suggest any substitute for the old, long-tried, and long-hated organization of American parties. Indeed, the difficulty of the organization and the impossibility of finding a substitute are apparently insuperable obstacles to the successful formation of any third party.

In the organization of national conventions the Democratic and Republican parties have always drifted in opposite directions. (1) Democratic conventions have always allowed the majority of delegates from any State to cast the vote of the State, thus disfranchising the minority. This is not often done, unless by a delegation which is voting for a candidate from its own State, but it always may be done: the minority in a State delegation votes by permission of its majority, not of the convention. There remains the danger that a number of States in which the Democratic nominees would have no chance of success may control the convention by enforcing this "unit rule." This danger is obviated by requiring two-thirds of the votes of a convention for a nomination. A Democratic convention is thus primarily a convention of State delegations; and this distinction is emphasized by the exclusion of delegates from Territories, whom the Republicans admit as a basis for a future State organization. (2) Republican conventions, on the contrary, regard only Congressional districts or individual delegates, and have repeatedly allowed minority delegates to vote even when the State conventions had expressly ordered them to vote as a unit. They have, therefore, no "two-thirds rule." But, as the party has become old enough in power to develop a school of "practical politicians," these latter have shown a strong liking for the unit and two-thirds rule, and have even endeavored to capture the party convention by enforcing the unit rule, and taking unfair advantage of the absence of a two-thirds rule. In 1880 they would thus have controlled the admission of contesting delegates and the final fashioning of the convention but for the insistence of the minorities in three of the State delegations upon their right to vote, and the convention's support of the claim.

The change which took place about 1824 can best be studied in Niles's *Weekly Register* for 1823–25, particularly in the numbers for Jan.-Sept., 1824. A full record of the different national conventions up to 1860 is in Greeley's *Political Text-book of 1860*; thence to 1880 in the *Tribune Almanac*.

V. The evils of the system, to an American, lie upon the surface, and are mainly seen in the primary caucuses. In country districts there is practically no means to regulate the membership of the caucuses, unless the dislike of an intruder's political opponents or his apprehension of personal violence may serve as restraints. It is therefore no uncommon manœuvre for a local leader to swamp his own primary meetings with a force of voters of opposite political opinions or of no opinions at all. Such a manœuvre has even been accomplished by a party wishing to commit its opponents to some dangerous programme or candidate. If the primaries are left unregulated in the cities, the danger is far greater, and they at once become a mere farce. To obviate this danger they are usually regulated too much, and membership in the bodies which hold the primaries is so restricted that they become mere cliques or implements of fraud. Many remedies have been suggested, but the most promising seems to be that proposed in Mr. D. C. McMillan's volume, cited below. Its essential idea is the statutory regulation of caucuses or primary elections, so that all such nominating meetings for any election shall be held at the same time and place. There could be thus no colonizing or swamping of conventions without a corresponding loss to the party which engineers the fraud. The plan is open to one very serious obtection—that it would be an attempt to prevent a citizen from voting for a candidate of his choice outside of those named at the primaries, and thus a violation of State constitutions. The objection might be met by allowing any person or organization, on paying the necessary expenses, to set up an extra ballot-box and nominate candidates. Under such a régime the citizen who neglected or refused to legally nominate his own candidate would have no more right to complain of his inability to vote for him than the citizen who neglects or refuses to register has to complain of his inability to vote at all. An effort to procure the adoption of the McMillan scheme by the New York legislature in 1881 was unsuccessful. In Pennsylvania the officers of every primary or delegate meeting must be sworn; and penalties are imposed upon any one who acts as an officer without being sworn, refuses qualified or accepts unqualified votes, commits any fraud in counting, or asks, receives, or offers a bribe. Somewhat similar laws exist in Ohio, Missouri, and California. It is very certain, however, that no remedy will be permanently successful until a reform of the civil service takes away the fundamental evil. Until that time a body of paid and disciplined troops will be kept constantly under arms, ready to find or make a practicable breach in the strongest legal wall that human ingenuity can contrive.

See Albert Stickney's *True Republic;* McMillan's *Elective Franchise in the United States;* and F. W. Whitridge's article on "The Caucus System" in Lalor's *Political Cyclopædia*, for the evils and proposed remedies in primary elections. For the introduction of the so-called Birmingham caucus in Great Britain see *International Review*, Aug., 1880. (A. J.)

CAUSATION is a fundamental conception of intelligence and a fundamental relation of known existence. Intelligence and known existence are each a process. According to the first and superficial appearance, they are both states rather than processes, and the simplest and most universal description of them seems to be this: viz. that they simply *are*. *Being* is their universal predicate. But, further, scientific examination reveals the fact that they *are*, only in virtue and on condition of something concurrently *done*. Nothing *is*, except on condition that something *takes place*. There is naught that, whether in the ideal realm of knowing mind or in the objective realm of known fact, simply *has* or *possesses* existence. On the contrary, all existence is *maintained*, and *is*, only so far as it is *maintained*. The maintenance of existence is an active process, and this process is a *causal* one. With reference to the process, considered as cause, the resulting state of existence is termed the effect. Cause and effect are thus correlative terms, of which the latter denotes dependence, and the former absolute or relative independence. Cause and effect may also be regarded as different aspects of the same thing, or of the same reality, or real process; and so far as this is true, it is just to say that every cause is *cause of itself* (*causa sui*). Whatever is or takes place, in some sense, causes itself to be or to take place. This notion of causation as self-determination, or *causa sui*, is generic, and reappears, with or without qualification, in all the various senses in which the term Cause is used.

The different senses in which the terms Cause and Effect are employed and understood may be classified as follows: 1. Primary or literal, philosophical, ontological; 2. Secondary or non-literal, subdivided into—*a.* Logical; *b.* Mathematico-physical and phenomenal.

1. The most important analysis and definition of the causal conception in ancient philosophy were furnished by Aristotle, who distinguishes in the case of all things "which are by nature," as also of all works effectuated through the intelligent agency of man, four aspects, to each of which the name of cause is given, as follows: 1. The Material Cause; 2. The Formal Cause; 3. The Cause of Motion; 4. The Final Cause. Of these, the first is purely conditional, and denotes, with reference to the effect to be produced or realized, nothing but a potentiality or possibility. Thus, in the block of marble there lies a possible statue. In earth, air, and water are contained the possible constituents of a future tree. The marble does not of itself create the statue, nor do the material elements produce the tree. But the statue is not without the marble, nor the tree without the elements. Moreover, the perfection of the finished work or result, the statue or the tree, is dependent on the quality of the material employed. Thus, the material cause is only conditional, and corresponds to what has otherwise been termed the passive cause. In other words, it is no true *cause* whatever. The true cause, therefore, is to be sought among the three remaining "causes," or, rather, it is to be sought in all of them at once. For these three, as is perceived and pointed out by Aristotle, are in truth identical, or are, as it were, but different aspects of one and the same reality. By the "Formal Cause," Aristotle understands the *εἶδος*, the form, idea, type, or definable nature of the thing in question. Thus, the formal cause of all trees is the universal tree-form—of all oak trees, the universal yet specific oak-form, etc. But here, again, it is obvious that we have not yet before us the true cause. The form, idea, or type enters as a necessary and fundamental element into the definition of the essence or completed nature of the tree. But taken by itself it is an impotent abstraction, and not a power to produce the tree and by an active process to maintain it in living existence. The tree is not, except by virtue and as the result of a process, whose end or "Final Cause" is nothing other than the specific form or type (*i. e.* the Formal Cause) itself. Thus, Formal and Final Cause are identical. They are the same thing under different aspects. But, again, these two "causes" are not sufficient by themselves to constitute the true cause. The true cause is not without them, and they are *in reality* not without it; viewed in separation from it, they are dead and unreal abstractions. The true cause must of necessity be an actively efficient or productive one, and can accordingly be sought only in the Cause of Motion. But a true cause of motion cannot be sought in another and antecedent motion. Motion may be communicated or transferred, but has no power either to initiate new motion or to determine the law or direction of its own communication or transference. Motion is only an abstract and dependent phenomenon, not a concrete and effective reality. The cause of motion must be concrete and effective; it must have power. As having power, it must possess either absolute, or at least relative, independence. Its power, further, can be manifested only in the form of self-determination. But self-determination is a fundamental and characteristic attribute of intelligence, or of living Mind, Spirit, or Νοῦς. The power which belongs to the cause of motion will therefore be a power of Spirit, or of something generically identical therewith. It will also be living, for "life is energy of Mind (Νοῦς)." The power, life, or reality of mind, so far as it is manifested in dependence on material conditions, or in and through "a body," is called Soul. The Cause of Motion for the tree, therefore, or the immediate, active, and creative principle of its growth and existence, will be its soul. But the "soul of the tree" is only another name for the

nature of the tree itself, conceived no longer under the form of abstractions, such as the Formal Cause and the Final Cause (abstract type or species, and end in view), but as what it is in immediate, experimental reality—viz. as the type or end in view immediately and actively realizing itself. The Final and Formal Cause are thus identical with the Cause of Motion. Only, they must no longer be viewed by themselves as helpless abstractions, but rather as actual yet ideal functions of a psychical, and hence living and effective, reality.

Aristotle, as is well known, distinguishes, among natural existences, three kinds of soul, termed vegetative, sensitive, and rational. The vegetative soul has, for its characteristic functions, assimilation and reproduction; the sensitive soul, sensation and, generally, locomotion; and the rational soul, the use of reason. In man the three souls are combined in organic unity. To the question, how the lower forms of soul are to be conceived in separation from the higher, or what, in Leibnitzian phrase, may be the "internal states" of (for example) a purely vegetative soul, it may be difficult to furnish an explicit answer. The question is, however, irrelevant to the matter of fact demonstrated by Aristotle, that the realities (or "forms of soul") thus designated exist, and that *primary reality* and *strict causal efficiency* belong to them alone. The Absolute, according to Aristotle's demonstrations, is Mind or Νοῦς, and the Relative is only to be conceived and known as dependent mind, or mind in various dependent potencies; all of which presuppose, as a condition of their very existence, the Absolute.

It appears, then, that the conception of cause is, as such, of necessity a teleological conception. A true cause is ideally, and not mechanically, determined, and its nature is spiritualistic. Further, every such cause is *causa sui*. We have seen how this is true in the case of natural organisms. The like holds true in the case of human works of art or skill. The physician heals, says Aristotle, only by virtue of his having in him the idea (Formal Cause) of health (Final Cause), and in employing means to restore health he is but an instrument for the *realization* or *actualization* of the idea. Still more of obvious truth is there in the assertion that the genuine artist is possessed by a creative idea, which simply realizes itself through his instrumentality. Yet in all these cases the cause is only dependently *causa sui*. The soul of the tree exists only in dependence upon the earlier existence of another tree, in whose seed its "soul" was germinally contained. Further, it is dependent on material causes, as above set forth. Its nature, too, is "specific," and hence only limited or partial. It is not all-comprehensive and absolute. Again, the form of its psychical life is imperfect and dependent. By its limitations, and by its organic dependence on the Absolute, it points to the latter—not abstractly and "ideally," but livingly and really. This is expressed by Aristotle in the guise of an attribution to all "natural" things of a tendency, a yearning or love, which leads them to see or to seek in the Absolute their own law. The true law of all existence, and the inherent law of all purely natural existence, is, so far as possible, to "resemble God." Thus it is that in the realm of finite relations all true causes are only dependently *causæ sui*. God, in whom are no unfulfilled potentialities, and who has therefore no Material Cause, is pure, complete, self-fulfilling energy of Νοῦς. In other words, the Absolute is absolute *causa sui*.

It has seemed best to dwell at this length upon the doctrine of Aristotle, because it represents the result of the first *methodical* and also relatively successful attempt, in the history of European philosophy, to demonstrate the substantive or ontological meaning of causation. The conclusions reached by Aristotle are identical in kind with those which have always rewarded similar inquiry. The search for cause is the search for power, and power is never found or known, and hence never demonstrated, except as an ideal or spiritual value. Those who deny the reality or cognoscibility of all such values—a denial which is always founded on an abstract or partial theory of knowledge as consisting solely in passive sensation—have no explanation whatever to give of *power*. They accordingly seek to explain our belief in it as substantially illusory (Hume and James Mill), or else arbitrarily and dogmatically declare it to be unknowable.

In modern philosophy, which reaches its most perfect systematic expression in Hegel, ontological inquiries have been founded on epistemological ones, or the Science of Being has been approached by the way of the Science of Knowledge more explicitly and obviously than in ancient philosophy. Another peculiarity of modern philosophy results from the circumstance that it has been contemporaneous with a remarkable growth of mathematical and physical science, and has had to formulate its results in such way as to adjust them to modern physical conceptions. Hence a corresponding peculiarity in the way in which the subject of causation is approached and handled by Hegel (for example). The substantive results reached are essentially identical with Aristotle's conclusions. But the law of the process of causation, as essentially an organic process, has been formulated by Hegel with more of systematic completeness. The English reader may with profit compare, on this part of the subject, Bishop Berkeley's *Principles of Human Knowledge* and his *Siris*.

2. The word Cause, in a non-literal sense, is employed with many different shades of meaning, all of which may be brought under the two heads of Logical and Mathematico-Physical "Causation."

a. Logical. That which accounts for or explains, in any way, any truth, fact, or event, is often spoken of as the cause of such truth, fact, or event, independently of the perception, recognition, or acknowledgment of any true causal relation or productive agency whatever. In all such cases the relation contemplated is purely one of logical implication.

The typical illustration of the application of this notion of logical causation is furnished in the *Ethica* of Spinoza. Here whatever is involved or contained in the conception, nature, or logical "essence" of anything is said to "flow," as an effect, from such conception or essence, as its cause. It is contained in, and hence follows as an "effect" from, the nature of the triangle, that all its angles are equal to two right angles. This is Spinoza's standing example of the causal relation. The relation, as is at once perceived, is one of purely abstract ideal dependence, according to the logical principle of identity. The equality of all the angles of the triangle to two right angles is a part of the nature of the triangle. It is, *pro tanto*, identical with this nature. It is obvious that this is a case of causation only in a non-literal, secondary sense. But if we agree, nevertheless, to *call* it a case of causation, it is evident that, in virtue of the logical identity of "cause" and "effect," or of the "nature" of the triangle on the one hand, and the equality of all its angles to two right angles on the other, the "cause" in question can only be regarded as *causa sui*. Spinoza, however, reserves this designation exclusively for the case of "that whose essence involves *existence*, or that whose nature cannot be conceived except as *existing*." This is variously termed by Spinoza "God," "Nature," and "Substance." Now, the "causal" relation asserted as obtaining between the divine essence and the divine existence is precisely like that above illustrated by the case of the triangle. The divine essence is nothing but the logical conception or definition of "God"—*i. e.* of absolute Being or "Substance"—and the divine existence is simply an identical part of this conception. It is this, and nothing more. It is only a part of a *conception*. But the *name* of this part is *existence*, and the name is ambiguous. For it may denote either the logical conception of existence, or objective reality itself. These two meanings are confused by Spinoza. And in yielding to this confusion Spinoza gives evidence that there lurked unperceived in his mind a (legitimate) feeling that the conception of causation is peculiarly an ontological one, including more than the merely logical relation of abstract identity, which alone is really contained in his definition of *causa sui*, and is perfectly illustrated by his standing example of the triangle, etc. The *conception* of existence, now, is involved in the Spinozistic conception of the "divine" essence. Hence the latter is termed in particular *causa sui*, as though by virtue of the just-mentioned logical relation the divine essence actually gave itself absolute, objective *existence*. This is an obvious *non sequitur*. The divine or absolute Being is, indeed, as indicated in the foregoing section, absolute *causa sui*. But this is not because the definition of his essence includes the conception of existence, but because his existence is grounded in a living process, which itself is wholly self-determined, or dependent on naught foreign to itself.

There is no realm or department among the objects of knowledge where the relation of logical dependence or involution does not more or less explicitly obtain. The ultimate pre-supposition of all science is that "all things consent together," constituting an harmonious or intelligible whole, each part of which, in Leibnitzian phrase, is a mirror of the universe, or logically implies and points to the universal whole. The logical implication here is often less clear and definite than in the case of the triangle and the theorems demonstrable concerning it, since the detail of the relations involved is constantly changing with the changing universe, while the relations of the ideal triangle undergo no change. But, with this exception, the two cases are alike. They are alike in kind. And, now, it may be said in general that all cases of the non-literal use of the terms cause and effect are cases in which the logical relations, or a relation which simulates the logical one, is confounded with the truly causal one. The *ratio cognoscendi* is substituted for the *ratio essendi*. So in the following title of a book recently published: *Capital and Population: A Study of the Economic Effects of their Relation*. The general relation of capital and population involves particular economic relations, which are termed "effects" of the former—of course only in a non-literal or secondary sense. But with this last example we have already passed, practically, into the realm of—

b. Mathematico-physical causation. By this phrase is meant causation as it is understood in purely physical science, whose objective data are all, and characteristically, sensible (acquired through sensible observation), and whose model and instrument of method are found in the mathematical sciences.

The theory of physical causation is peculiarly a product of modern inquiry. Since purely physical science is nothing but sensible—sense-conditioned—knowledge reduced to scientific form, the theory of physical causation is founded in, and is a part of, the theory of sensible knowledge. Inasmuch as physical causation, as a conception of sensible knowledge or of purely sensible relations, is not the same thing as philosophical or ontological or (as we have termed it) true causation, and inasmuch as, in an undeveloped form, the notion of true causation holds the first place in the instinctive thought of mankind, and was also the first to be explicitly and scientifically developed in the historic order of ancient speculation, it follows that the first step toward the development of the conception of physical causation would, not unnaturally, take the form of a criticism of the philosophical conception, conducted by those who held that sensible knowledge, or knowledge of purely sensible and hence mechanical relations, was the only kind of knowledge possible to man. At all events, this negative first step—and this alone—was taken by the ancient Sceptics. The modern discussion, starting especially with Hume, began with a step of essentially similar kind.

The question about physical causation is, What meaning, if any, has the word "causation" within the limits of purely sensible knowledge? Sensible knowledge is knowledge whose form and content are conditioned by the forms of space and time; or, it is knowledge of objects whose fundamental forms and relations are those of space and time. The question, then, is, What, if anything, is the causal relation as a relation of space or of time? The fundamental relations of space and time are coexistence and sequence. Physical causation will therefore be a relation of coexistence or sequence. More particularly, it will be a relation of coexistence or sequence among sensations or impressions, otherwise termed sensible phenomena or "objects."

Now, according to Hume, all relations of coexistence or sequence among impressions are fortuitous. Moreover, *all* relations among impressions are originally—*i. e.* considered with reference to the order of their occurrence in individual consciousness—relations of succession. Let, now, A and B denote two impressions, one of which (B) occurs after the other (A). Here is a case of matter-of-fact sequence—a *given* relation of succession. What is further to be said about it? Can we say that B was obliged to follow A, just as, according to the philosophical conception, an effect must necessarily follow or accompany its cause? In no wise; for A and B are simply so many "independent existences," having no necessary, nor any other real, connection "that the mind can discover." All that can be said is simply to repeat the immediate matter of fact, that in this case B follows A. If this succession occurs only once, it attracts no special attention. It is regarded as simply fortuitous, and having no special significance. If it occurs several times, A and B become "associated" with each other in our consciousness, so that the thought of the one tends involuntarily to be followed by the thought of the other, and the observation of the one is accompanied by a more or less confident expectation that the other will be presently observed. And when the succession occurs "habitually," the association becomes (in the language of Hume's successors) inseparable, and the succession of B after A is called a case of causation.

Causation, then, viewed as a sensible relation or as a relation of time, is habitual succession. *Per se*, nevertheless, or considered with reference to the nature of the terms (as A and B) which respectively precede and follow each other and are *termed* cause and effect, there is no reason why one should stand in the place of cause and the other in that of effect. To the eye of reason their relation is accidental, and (in Hume's words) "any thing may be the cause of any thing."

Kant took up the problem of physical causation where Hume left it, and subjected it, in the *Critique of Pure Reason*, to a further investigation, which has become famous. As to the substance, or substantial meaning, of physical causation, in particular definite cases or classes of cases, Kant agrees with Hume. Hume's "habitual succession" is but another name for "regular succession," and this Kant finds to be the essential import of physical causation. In what particular order phenomena shall succeed each other—whether A shall, for example, precede or follow B—we can in no wise anticipate. Here reason helps us not, and, for aught we know, "any thing may be the cause of any thing." The actual "rules of succession" among phenomena must be learned by observation. But that which, in advance upon Hume, Kant demonstrates is (we may say) this: viz. that "some thing must be the cause of some thing," or, in other words, that there *must be regular succession* among phenomena. That the particular phenomenon A should regularly precede the particular phenomenon B may be, for our knowledge, an altogether contingent or irrational fact. But that the order of sequence among phenomena, whatever it may be in detail, must be regular, this, Kant demonstrates, is not a contingent but a necessary truth. It is a truth capable of being *a priori* determined, independently of all particular, observed orders of succession, by examining the nature of sensible knowledge itself or of the conditions without which no such knowledge is possible. One of these conditions is that sensible phenomena shall be clad in the form of time. But time, abstractly considered, is nothing but definite and irreversible succession. There must therefore be found among phenomena a definite and irreversible order of succession. Otherwise, time would not be their "form," and they could not enter into our knowledge. Physical causation, then, is regular sequence. It is primarily a regular sequence of perceptions. But since coexistence is known only through perceptions, which themselves take place in time, and are hence successive, it follows that physical causation includes all cases of regular coexistence. In brief, then, physical causation is nothing other than physical law. The conception of such causation strictly excludes the ideas of force and substance. The physicist, *as such*, knows no force, but only motion. Nor is real substance or "being" known to him, but only figured space.

It is plain enough that physical causation is, when strictly interpreted, only by courtesy so called. It is causation only in a non-literal or secondary sense. Our statement that in all uses of the word "cause" the sense of *causa sui* is, "with or without qualification," contained, is here verified through the relation of mathematical equality which subsists between physical cause and physical effect. This is expressed in the principle of the Conservation of Energy, which is now held to express the widest generalization or "law" of physical science. The sum-total of energy—potential and kinetic—is held to be a constant quantity. Its forms are constantly changing, but the value of their sum-total does not change. This is true for a whole "system of things" (*i. e.* of phenomena conditioned by space and time), and is equally true for any portion of such a system. The whole state of things at any instant is the physical "effect" of the whole state of things in the foregoing instant. This means that the present state of things followed by law after the foregoing one, and that the mathematical expression for the present state of things—if this expression could be found—represents exactly the same value as the like expression for the foregoing state represented. Cause and effect are identical in value, and in this sense the former is *causa sui*. (G. S. M.)

See Vol. V. p. 227 Am. ed. (p. 261 Edin. ed.).

CAVALRY. The cavalry arm of the U. S. military service amounted to little during the War of the American Revolution. Two regiments of light dragoons from Virginia and one from Pennsylvania were raised and taken into the Continental service. A fourth regiment was raised, agreeably to a resolve of Congress, in 1776, and a single troop was raised by the same authority in 1778 "to attend the provost-martial." Three legions were also authorized in 1777, 1778, and 1779. On the completion of the war these skeleton organizations were entirely disbanded, to the great annoyance and, as it proved, the discomfiture of Gens. Harmar and St. Clair in their campaigns against the Western Indians. To supply the deficiency, Congress in 1792 gave the President power to raise a squadron to serve for three years. The officers and their monthly pay were as follows: major-commandant, $55 per month; and in each of the four troops—1 captain, $40; 1 lieutenant, $26; 1 cornet. $20; 6 sergeants, $6; 6 corporals, $5; 1 farrier, 1 saddler, and 1 trumpeter, $4. The privates were to be paid $3. This nucleus of the American cavalry, organized at Pittsburg in 1793, under Major William Winston of Virginia, moved at once to reinforce Gen. Wayne at Fort Recovery in Ohio. In the battles at that point and at the Maumee Rapids, both in 1794, Gen. Wayne acknowledged the effective co-operation of "the legionary calvary." In spite of this record, however, the whole force, with the exception of two small troops, was disbanded as the periods of enlistment expired in 1795–96. Six troops were added in 1798, the whole now forming a regiment under the command of Lieut.-Col. commandant John Watts of Virginia. The new men were "enlisted for and during the continuance of the existing difference between the United States and the French Republic, unless sooner discharged." An act of Congress in 1799 authorized three more regiments of cavalry, each with five squadrons of two troops each. These regiments were never filled, and in 1800 Congress ordered the disbanding of all but the two original troops. Two years later even this handful was legislated out of existence.

The United States had then no cavalry service, until in 1808 a regiment of light dragoons (eight troops) was organized under Col. Wade Hampton of South Carolina. Leonard Covington afterward appeared as the chief commander. In 1812, Congress authorized another regiment of twelve troops. The main dependence for cavalry during the War of 1812 was upon the volunteer force, which distinguished itself at the battle of the Thames, while the regulars won their laurels at Chrystler's Farm. Congress ordered the consolidation of the two regiments into one in 1814, and at the close of the war once more abolished the cavalry service. It had been shown by the campaigns of Harrison and of Jackson against the Indians that the volunteer cavalry was of inestimable value, both in action and as a material from which recruits might be taken for regular forces. Hence in 1832, when the Black Hawk War arose, Congress authorized a battalion of mounted rangers under Henry Dodge of Wisconsin as major commandant. A year later this was merged into the First regiment of dragoons at Jefferson Barracks, and the newly-formed organization proceeded at once to the West and the South. In 1836, Congress authorized the raising of a second regiment of dragoons at Jefferson Barracks. When organized, the new regiment departed for the seat of the Seminole War under the charge of Col. David E. Twiggs. The First regiment, operating in the South-west, disarmed the Texan invaders of the United States soil in 1843, and in connection with the Second regiment gave important aid to Gen. Taylor at Palo Alto and Resaca de la Palma. Upon the declaration of war with Mexico, Cols. Kearney and Twiggs of the two regiments of dragoons were raised to the rank of major-general, and a regiment of mounted riflemen was authorized by Congress. The latter did effective work as infantry at Cerro Gordo and Chapultepec, their horses having been lost in a storm on the Gulf of Mexico. Dependence for mounted men during this war was largely placed upon the volunteers from the Southern States, who often did the heavy fighting, as at Monterey, Buena Vista, Contreras, Churubusco, and Molino del Rey. Another body of cavalry wrested California from the Mexicans by a bold dash. In 1847 the greater part of the regular dragoons were sent with Gen. Scott toward the interior of Mexico, where they often met those "relentless riders" known as lancers. Congress now ordered a third regiment of dragoons, and the command was given to Col. Edward G. W. Butta of Louisiana. This regiment was disbanded in 1848. The riflemen were also disbanded, but they were at once recruited and reorganized. The annexation of large tracts of territory to the south-western portion of the United States, and the hostility of the Indians who came with the land, rendered the service of the two regiments of dragoons of small account, scattered as the companies were from one end of the country to the other. Congress, therefore, in 1855 ordered the raising of two regiments, to be known as cavalry in distinction from the dragoons. The distinction was practically without a difference, since all of the three classes of mounted men at that time, and since, might be grouped under the generic term "light cavalry."

Cavalry during the Civil War.—As commander of the department of Texas, Gen. Twiggs had already surrendered to Gen. McCulloch of the Confederates Government stores, munitions, etc., to the value of $1,500,000, for which action he had been dismissed the service. The example of Twiggs was followed by most of the officers in the two regiments of dragoons, the regiment of riflemen, and the two regiments of cavalry; almost all of whom came originally from the Southern States. This gave a decided advantage to the enemy, and left the Union service deplorably weak as to the cavalry arm. The proclamation of Pres. Lincoln calling for 75,000 volunteers was followed by an order increasing the regular army, one of the items being the organization of a third regiment of cavalry, which was placed under the command of Col. David Hunter. There was a dissatisfaction among the officers and men of the regulars because Congress had changed the names of the regiments, so that they should be as follows: The First regiment of dragoons to be known as the First regiment of cavalry; the Second dragoons as the Second cavalry; the mounted riflemen as the Third cavalry; the First cavalry as the Fourth cavalry; the Second cavalry as the Fifth cavalry; and the Third cavalry as the Sixth cavalry. These six regiments, fully recruited, constituted the entire regular cavalry during the Rebellion. The work of recruiting for the volunteer service was slow in starting. But after a time, Congress having ordered that each regiment should be entitled to three majors and should consist of twelve full companies, the recruiting was carried on more briskly. Congress also, in 1863, strictly defined the legal organization of a regiment and also of a company. The cavalry bureau of the War Department was established to take charge of all recruits, supplies, dépôts, etc., Maj.-Gen. Stoneman being placed in charge. The volunteer cavalry, as finally recruited during the Rebellion, is recorded as follows: New Hampshire, Vermont, Connecticut, Delaware, Alabama, Texas, Oregon, Colorado, Nebraska, Nevada, and District of Columbia, 1 regiment each; Maine, Rhode Island, New Jersey, Arkansas, and Minnesota, 2 regiments each; Massachusetts, California, and New Mexico, 3 regiments each; West Virginia and Wisconsin, 4 regiments each; Maryland, 6 regiments; Kansas, 8 regiments; Iowa, 9 regiments; Michigan, 11 regiments; Tennessee and Indiana, 13 regiments; Ohio, 14 regiments; Kentucky, 16 regiments; Illinois, 17 regiments; Pennsylvania, 21 regiments; Missouri, 24 regiments; and New York, 25 regiments. In addition to these there were 6 regiments of colored cavalry and several of mounted infantry. It may be readily inferred that the Confederate cavalry not only took the lead of the U. S. cavalry from the start, but that it also maintained that lead well toward the middle of the Civil War. It is true that Gen. Joseph Hooker collected the cavalry into several corps while he was commanding the Army of the Potomac, but no good results were apparent either in that quarter or among the armies of the West. The brilliant raid of Col. Grierson—who swept through Mississippi from Memphis to Port Gibson—attracted the attention of the military authorities as a splendid piece of work performed by a splendidly equipped organization. The result was the formation of "the Cavalry Corps of the Army of the Potomac," which Gen. Grant entrusted to the command of Gen. P. H. Sheridan. Old army officers shook their heads when they saw that the organization by corps—so fatal to Napoleon—had been carried out with three divisions of 5000 men each. But the result proved the wisdom of the decision, and showed that the former disasters to the Army of the Potomac under Gens. Pope and McClellan might have been averted had the cavalry arm of the service been as well organized and as well drilled as were the infantry and the artillery. Up to this time the prestige of the Confederate cavalry had received no check. The Southerners were good riders and each man owned his horse; hence the success of the dashing raids by Morgan, Mosby, Gilmor, and Stuart. But after the capture of Morgan and Gilmor and the killing of Stuart in 1864, the cavalry corps of the Army of the Potomac became an almost invincible power, aided, as it was, by batteries of flying artillery, chiefly from the regular army. In the campaign of 1864 the first division of the corps was commanded by Gen. Torbert; the second division, by Gen. Gregg; and the third division, by Gen. J. H. Wilson. In addition to the above a smaller division in the Army of the James was commanded by Gen. Kautz. Opposed to this corps was the Confederate cavalry corps of the Army of Northern Virginia under Gens. Wade Hampton, Fitzhugh Lee, and William H. F. Lee. During the same year Gen. Wilson was made chief of cavalry in all the armies of the West. The success of Sheridan's reorganization of the Eastern cavalry led Wilson to try a similar experiment with the Armies of the Ohio, the Tennessee, and the Cumberland, with the same gratifying results. Toward the accomplishing of these results credit must be given to the formation in "double rank" and to the Spencer magazine carbines, as well as to the *morale* that arose from an organization that was far superior to any that had preceded it. The prominent battles in which the cavalry bore a conspicuous part were those of Winchester, Yorktown, Hanover Court-house, Gaines's Mills, Iuka, Corinth, Murfreesboro', Kelly's Ford, Ream's Station, Opequan, Petersburg, Selma, and Five Forks. The leading generals in the U. S. calvary service during this war, besides those already named, were Gens. Pleasonton, Kilpatrick, Brackett, Stanley, and Powell Clayton. Gens. Chalmers and Forrest were the leading Confederates not already noted. The volunteer cavalry was disbanded at the close of the Civil War in 1865, but the regular cavalry was recruited, so that now (1883) it numbers ten regiments, which are used as mounted infantry against the Indians of the West and the South-west. Each regiment contains twelve companies or troops, two troops forming a squadron. The number of privates assigned to each company is 78, thus making, with the officers, a sum-total of over 8000 men as the present strength.

Arms.—The changes that have taken place in the manner of arming the cavalry are of great interest. The First regiment of dragoons, organized in 1833, was supplied with firearms as follows: one flint-lock pistol and one Hall's carbine per man. These were superseded in 1849 by the percussion pistol and the musketoon. A little later, also in 1849, the Colt's pistol was first supplied, and this weapon gradually took the place of the percussion pistol. In 1853, Sharp's carbines were issued as experimental arms, and they were subsequently sent to both the First and the Second regiments of dragoons. Five companies of the latter were provided with the Colt pistol-carbine, which was the pistol proper with a stock that might be removed at pleasure. In 1858 the cavalry were armed as follows: First regiment—eight companies with Sharp's carbines and two companies with Burnside's carbines; Second regiment, eight companies with rifle-carbines (muzzle-loaders made at Springfield) and two companies with Sharp's carbines. At that time the musketoon, although regularly adopted, had gone almost entirely out of use, because of its short range and want of accuracy. Its manufacture had been discontinued, and down to the breaking out of the war in 1861 no arm had been regularly adopted in its stead, the use of the various kinds of carbines being merely tentative. The only other firearm regularly adopted for the use of the cavalry for several years before the Rebellion was the Colt's pistol, or revolver. There were also no regularly prescribed equipments for horses, the various patterns, such as Jones's, Hopes's, Grimsley's, and McClellan's, being simply experimental. The war of the Rebellion put all theories to the test, and left those results that can come only from severe trials in the field. The Spencer magazine carbine and the Remington revolver shared the reputation of the Sharp carbine and the Colt pistol. The "McClellan" saddle, adapted from the Mexican, with improvements that had been tested in the Crimea, became the standard, together with Blakeslee's cartridge-box and other definite accoutrements. The Ames sabre was often thrown away as useless, its rejection by the Confederate cavalry being almost complete, and more reliance was placed upon the pistol. It has been urged in defence of the sabres that they were so dull as to be useless during a charge. But the truth is, they were discarded because, as a rule, there were no expert swordsmen in the service, and, naturally, the soldier or the man will affect to despise the weapon that he cannot use. It has been suggested that the keen blade of the Solingen sabre should be substituted for the dull blade now in use, and that strict attention be given to sword-exercise. Such a course, it is claimed, would increase the *morale* of the cavalry and render it more invincible whenever it resorts to the charge. But down to the present time nothing could be more assured than the failure of the sabre.

Tactics.—The U. S. system of cavalry tactics, slightly modified, is that of the French service, translated and authorized in 1841 by Hon. J. R. Poinsett, the Secretary of War. This system was adopted because of its peculiar adaptation to the light cavalry as distinguished from the heavy cavalry of the other nations of Europe. During the War of the Rebellion, however, there were few cavalry charges, the nature of the warfare and the topography of the battlefields admitting of no such movements. Whenever the open field was taken, however, the line of battle in corps front was formed in this manner: Each brigade detached a regiment to cover its whole front with a chain of skirmishers that often exceeded a half mile in length; two more regiments followed in line behind each wing, about 200 yards apart, with sabres drawn; the rest of the brigade then formed a third line in column of fours. Such occasions were rare, the duties of the cavalry consisting, for the most part, in making reconnoissances, covering retreats, and picketing approaches. By far the greater part of the actual fighting was done on foot, the horses serving to convey the body from place to place with the greatest despatch. The cavalry thus became a kind of mounted infantry working under the "instructions for dismounted fighting" contained in the Cavalry Tactics. The men, dismounting from their saddles, were fresh for a run. When they had pushed the enemy and crowded him back, the led horses, now rested, were brought up and the pursuit was continued on four legs instead of two. Retreats were covered in a like effective manner. The advance of an army was protected by a skirmish-line of dismounted cavalry so thinly drawn out that 10,000 men would cover a front of five miles, and yet even the most daring of the enemy would hesitate to break through the ranks that might be so readily concentrated in one spot. (F. G. M.)

CAVEAT, in law, a notice not to do an act, given to some officer, either ministerial or judicial, by a party having an interest in the matter. Caveats are frequently filed with judges of probate courts to prevent the admission to probate of wills the validity of which is contested, or the granting of letters testamentary to persons who it is claimed are not entitled thereto. The effect of such a caveat is to postpone the admission of the will to probate or the granting of the letters until due investigation has been made.

In patent law, a caveat is a legal notice to the Patent Office not to issue a patent of some particular description without allowing the caveator, or person filing the caveat, an opportunity of establishing his priority of invention. Such a caveat is intended to answer a double purpose: 1st, to give notice of the caveator's claim as an inventor; 2d, to prevent the issuing of a patent to another party for the same thing. By the provisions of the Revised Statutes of the U. S., sect. 4902, it is stipulated that any citizen of the United States making an invention or discovery, and desiring time to mature the same, may file in the Patent Office a caveat setting forth the design thereof and its distinguishing characteristics. Such caveat is filed in the confidential archives of the office and preserved in secrecy, and is operative for the term of one year. If within that time application is made by any other person for an invention in any way conflicting with that for which the caveat has been filed, notice thereof is sent to the caveator, who may thereupon, if he pleases, at any time within three months thereafter, establish his right of priority of invention by filing his description, specifications, drawings, and model in the Patent Office.

An alien who has resided in the United States for one year, and who has made oath of his intention to become a citizen, is also entitled to the benefits of this act.

CAVY, any one of several small South American quadrupeds of the family *Caviidæ*, order *Rodentia*. The *Caviidæ* are a family of the Hystricine series of simple-toothed rodents, composed of the genera *Cavia*, *Dolichotis*, and *Hydrochœrus* (see CAPYBARA), which agree in being four-toed in front, three-toed behind, all the digits terminating in hoof-like nails; the tail very short or rudimentary; the upper lip not cleft; the incisors short, the molars divided into transverse lobes by folds of enamel, the milk-teeth shed *in utero*. The best-known cavy is that so often kept in confinement under the misleading name of "Guinea-pig," perhaps changed from Guiana-pig; this is the *Cavia cobaya* of authors, supposed with some reason to be an artificial variety of the restless cavy, *C. aperea*; but is not regarded as settled. Other species of the genus are *C. boliviensis*, *C. rupestris*, and *C. australis*, all of South America, especially its southern portion, and in the Andes up to some 10,000 or 12,000 feet. The Patagonian cavy (*Dolichotis patachonia*) is very different from any of the foregoing, much larger, with longer limbs and ears, and altogether more resembling an AGOUTI (which see) of the family *Dasyproctidæ*. (E. C.)

See Vol. V. p. 240 Am. ed. (p. 277 Edin. ed.).

CAYUGAS. See IROQUOIS.

CAZENOVIA, a village of Madison co., N. Y., on Cazenovia Lake and Chittenango Creek, 18 miles S. E. of Syracuse. It is on the Syracuse, Chenango, and New York Railroad at its junction with the Cazenovia, Canastota, and De Ruyter Railroad. It has six churches, the Central New York Seminary, two banks, one weekly newspaper, a public park, three hotels, and manufactures of guns, flour, lumber, woollen goods, machinery, sash, blinds, etc. It was laid out in 1793 on land purchased by the Holland Land Company, and named in honor of their agent in Philadelphia, Theophilus de Cazenove. It was incorporated in 1810, and at that time carried on considerable trade. Its prosperity was diminished by the completion of the Erie Canal. Its property is now valued at about $771,650, and its annual public expenses are about $4000. It is surrounded by picturesque scenery, including several cascades, and is a pleasant summer resort. Population, 1918.

CEDAR-BIRD. See WAXWING, and AMPELIDÆ.

CEDAR CREEK, a small stream which rises in Shenandoah co., Va., and with a general south-easterly course empties into the north fork of the Shenandoah River about 3 miles east of Strasburg, a station on the Winchester and Strasburg Railroad, 46 miles southwest of Harper's Ferry. On this stream was fought a very severe battle between the Federal troops under Gens. Wright and Sheridan and a Confederate force under Gen. Early, Oct. 19, 1864. The Shenandoah Valley was of great importance to the Confederates, not only on account of its rich harvests, but also of the facility with which they could threaten Washington and make incursions upon Pennsylvania and Maryland. Such diversions had often temporarily fettered the movements of the Army of the Potomac. To put an end to these troubles, Gen. Grant, then besieging Petersburg, had united the departments of West Virginia, Washington, and Shenandoah into the middle military division, and on the 7th of Aug., 1864, had appointed Gen. P. H. Sheridan to the command—a young officer whose judgment, skill, and valor had been displayed in many actions. The Union force under his orders consisted of the Sixth and Nineteenth corps, the infantry and cavalry of West Virginia, constituting the Eighth corps, and two divisions of cavalry under Torbert and Wilson, with Custer and Merritt as brigade commanders. There were in all 40,000 men, of whom 10,000 were cavalry. Sheridan was for some time kept by Grant upon the defensive, but after a personal interview the general-in-chief allowed him to undertake offensive operations. He at once vindicated the confidence reposed in him. He defeated Early on a line running along the Opequan Creek to Winchester on the 19th of September, pursued him 30 miles, and two days after again routed him at Fisher's Hill, where he had made a stand, and sent him flying up the valley. Then, laying waste the entire region south of Strasburg, destroying all the grain he could not use, burning barns and mills, and driving before him many thousand head of cattle, Sheridan returned and posted his army behind Cedar Creek on separate ridges in rear of the east bank. The following was the arrangement of his troops: Crook, with the Eighth corps, occupied the advance and left of the line; Emory, with the Nineteenth, the centre, about half a mile in rear; on the right and somewhat retired was the Sixth corps (Wright's, temporarily commanded by Ricketts). Averill's cavalry was on the left flank, while Custer and Merritt guarded the right. Gen. H. G. Wright was left in temporary command of the whole, Sheridan having been called to Washington. Recovering from his defeats, and burning to retrieve them, Early now contemplated a surprise which came near resulting in a crowning victory. He had received a reinforcement of 12,000 men, raising his force to about 27,000. With them on the 18th of October he crossed the mountain separating the two branches of the Shenandoah, forded the north fork, and before day on the 19th, aided by the darkness and a dense fog, his advance columns lay within 600 yards of the sleeping Federal troops. He prepared a feint attack upon the Union right, and the left was simultaneously awakened by the rush and shouts of the Confederates. It was a complete surprise. Crook's West Virginia corps was rolled back and thrown into wild confusion. Meanwhile, another column advanced to the attack of Emory's Nineteenth corps, which was driven back in disorder. Ricketts, with the Sixth, changed front to the left to cover the retreat which was sweeping past him, when a column of the enemy tried to cut him off. Wright ordered Custer and Merritt from the right to the left flank to aid in protecting the retreat which he now ordered. Federal fugitives were now strewing the valley all the way to Winchester. Wright endeavored to make a stand and form a new line at Middletown, but there was not cohesion enough in the retreating masses to accomplish this. At last they were well in hand at a point between Middletown and Newtown, and here Wright succeeded in forming a strong line, not only for defence, but for again assuming the offensive. Such was the condition of things, and the disaster had been measurably repaired, when Sheridan came upon the field and resumed the command. He had slept at Winchester, 20 miles distant, but had started early in the morning, when he heard the sounds of battle, and, riding at full speed, arrived at half-past ten o'clock. His appearance and his words soon inspired new confidence; he turned back the retreating troops, and rode along the entire line to see the positions. He returned the cavalry of Custer from the left to the right, easily repelled an attack upon the Nineteenth corps, and at three o'clock ordered a countercharge along the whole line, the cavalry falling upon the Confederate flanks. Early's troops had many of them scattered to gather the spoils of the captured Federal camp, and his army was thus somewhat disorganized. They were driven back and put to rout, pursued by the Union army to their old camps, and then by the cavalry up the valley far beyond Strasburg, until nightfall. Never was a lost battle more handsomely retrieved. All the guns Early had captured in the morning, and twenty-three more, were taken, making forty-nine in all. The Confederate loss was 3000 in killed and wounded, 1500 prisoners, 50 wagons, 65 ambulances, and 1600 small-arms. The Federal loss was 3800 killed, wounded, and prisoners.

The results of the battle were of still greater importance. The Shenandoah Valley was for ever cleared of Confederate armies. The Sixth corps was sent to aid Gen. Grant in the operations in front of Petersburg, and two other divisions, principally of cavalry, were detached, one to the Army of the James, and the other to Savannah to guard the captures made by Sherman. On the 8th of November, Brig.-Gen. Sheridan was appointed by the President a major-general in the U. S. army "for personal gallantry, military skill, and just confidence in the courage and patriotism of his troops, . . . and a brilliant victory achieved over the rebels for the third time in pitched battle within thirty days." (H. C.)

CEDAR FALLS, a city of Black Hawk co., Iowa, is on the W. bank of Cedar River and on the Iowa division of the Illinois Central Railroad, near the junction of the Cedar Falls and Minnesota branch road, 99 miles W. of Dubuque. There is a railroad bridge across the river. The town has four banks (one national), a weekly newspaper, a public library, a State normal school and graded schools, eight churches, and well-shaded streets. It has good water-power, which is used in three large flour-mills, two grist-mills, an oat-mill, woollen-mill, paper-mill, pump and lightning-rod manufactory, and other industries. It was settled in 1845. Population, 3020.

CEDAR RAPIDS, a city of Linn co., Iowa, is on both sides of Cedar River, which is crossed here by five bridges. It is 219 miles W. of Chicago and 79 miles S. W. of Dubuque, on the Chicago, Milwaukee, and St. Paul Railroad, the Chicago and North-western Railroad, and the Burlington, Cedar Rapids, and Northern Railroad. The offices and car-works of the latter road are in this town. It has four banks, two prosperous insurance companies, an opera-house which cost $100,000, four hotels, one daily and seven weekly newspapers (one German), and a monthly agricultural paper, a public library, twenty churches, a good system of public schools, and is the seat of Coe College, a Presbyterian institution. It has gas- and water-works, fire-alarm telegraph, an active board of trade, and the city debt is only $35,000. It has a large packing-house, in which 600 hands are employed and 350,000 hogs are slaughtered annually. The wholesale trade, carried on by twenty-five jobbing-houses and employing fifty salesmen, amounts annually to $3,000,000. Having the most extensive water-power in Iowa, it is an important manufacturing town, with investments of $2,000,000, employing 1500 hands and producing annually goods valued at $7,000,000. The chief manufactures are machinery, agricultural implements, and carriages. The country around is noted for its dairy products. The city was chartered in 1856, and has grown rapidly in recent years. Population, 10,104.

CELLS, ORGANIC: THEIR STRUCTURE AND DEVELOPMENT. Important discoveries have been made in recent years concerning the organic cell, which greatly extend our knowledge of its formation and changes. These discoveries are due partly to improvements in apparatus, but more particularly to the improved methods of preparing and mounting organic sections for microscopic observation. By these means a much clearer insight into the details of organic structure has been attained. The subject, it is true, is as yet only partly elucidated, and much difference of opinion prevails concerning minor points; but there is little doubt entertained in regard to its main features.

The history of scientific opinion with regard to the organic cell as the unit of vegetable and animal structure has been a greatly diversified one. But it was for many years supposed to be established that the cell consisted of a microscopic mass of albuminous matter or *protoplasm*, usually surrounded by a membrane, generally containing minute granules, having in its centre a nucleus of denser protoplasm. The nucleus usually contains a smaller mass called the *nucleolus*, though occasionally both seem absent. In its division this body seemed to be constricted equatorially, the constriction always passing through the nucleus and separating the original cell into two new ones. Recently, however, it has been discovered that the structure and division of the cell have none of the simplicity here indicated.

The cell, instead of nearly being homogeneous and structureless, is really penetrated by numerous delicate fibres. These are specially present in the nucleus, which seems the active region of the cellular mass. They are not seen in the nucleolus. Some observers believe that the nucleolus and the granules are merely nodal points of the inosculating fibres, but the balance of opinion is in favor of the separate existence of the nucleolus. The intervening spaces of the fibrous network are filled with a homogeneous ground substance. It is a question whether the granules seen belong to this substance or are optical illusions. In the division of the cell its reticulated fibres pass through some particular transformations, which we will briefly epitomize. The process has been given the name of *karyokinesis*. Flemming thus describes this process, as seen by him in the cells of *Salamandra:* The cell displays periodical changes, passing from a quiescent to an active state, and the reverse. In the former, known as the resting stage, the nucleus consists of a faintly defined reticulum of fibrils whose meshes hold a homogeneous ground substance. One or more nucleoli and a few small granules are usually present. When treated with staining reagents during this stage the whole substance of the nucleus equally takes the stain. But during the whole active stage only the fibres take the stain, while the ground substance remains clear and transparent. From this difference of behavior it is argued that the cell-contents consist of two distinct substances, which are mingled in the resting stage, but become separated in the active stage. The stain-taking substance has been named *chromatin;* the unstained ground substance, *achromatin.*

When the active stage commences the membrane of the nucleus disappears; the nucleolus and granules also vanish. The fibrils lose their net-like arrangement, and become an irregular convolution, with no visible free ends. Around this fibrous mass appears a clear space, which separates it from the outer cell-substance. The nucleus in this state has been named the *aster.*

In the succeeding changes the fibrous convolutions first assume a wreath-like arrangement, with its bends irregularly directed towards the centre. Next, the wreath loses its continuity, and breaks up into a series of short, separate fibres, which form V-shaped loops. The bends of the loops are directed towards the central space, their openings outwardly. This arrangement forms the *mother star.* Various vaguely defined movements follow, in which the looped fibres are compressed towards the equatorial plane of the nucleus, separate into two masses with this plane between them, and turn until their bends are directed outward, their openings inward. If we view the cell as a globe divided into two hemispheres by an equatorial plane, then on each side of this circular plane will appear a smaller circle of fibrous loops, so arranged as to present something of the aspect of a circular basket. The converging, looped ends of the fibres are turned outward; the diverging, open ends are directed inward and face each other.

In the next stage of the process the basket-like figures recede from each other in the axial line of the cell until they reach the polar regions of the nucleus. Here the V-shaped loops re-arrange themselves, their bends again being directed towards a central space. The two new figures thus formed resemble that of the *mother star,* and are called *daughter stars,* the whole new arrangement of the nucleus being known as the *dyaster.* Thus a centralized arrangement of the fibrous nuclear contents and their separation into two oppositely placed masses are the primary steps in cell-division.

As the basket-like figures recede toward the poles, delicate striæ often appear in the interval between them and stretch from pole to pole across the equator. They form what is known as the *nuclear spindle.* They are most declared in vegetable cells and in segmenting ova, where similar faint lines often radiate from the poles towards the outer cell-surface, forming sun-like figures at each end of the spindle. The final division of the cell is preceded by the appearance of a row of dots across the equatorial plane, which appearance is probably caused by thickenings of the lines in the centre of the spindle. The lines of the spindle seem to be composed of achromatin, while these thickenings are apparently chromatin. They form what is called the *equatorial plate.* They soon divide, the lines of the spindle parting in the middle and the single row of dots giving rise to a double row, which appear like minute disks at the ends of the nuclear striæ. Thus a double equatorial plate is formed, enclosing a narrow equatorial plane. It is in this plane that cell-division takes place. A furrow appears around the exterior surface of the cell, which extends inward between the equatorial plates, and deepens until it reaches the centre. By this deepening constriction the cell is quickly divided into two new ones. Meanwhile new nuclei are forming at the poles of the spindle. The ends of the loops of the daughter stars unite and form a wreath-like figure. The bends of this figure change their positions until an irregular convolution is produced. This quickly assumes the reticular structure. Membranes form around the new nuclei. Nucleoli and granules reappear. The resting stage is regained. Thus by a process exactly reverse to that in which the original cell left its resting stage two new cells return to the resting stage.

Such is Flemming's typical case of cell-division. Other observers describe a process somewhat similar, though less regular in its details. There is a diversity of opinion about several points, which perhaps partly arises from there being a real difference in the behavior of cells from different sources.

We have spoken of the unsettled questions concerning the real or illusory existence of the nucleoli and the granules. It is also questioned whether or not the outer cell-substance is like the nucleus in structure. Klein holds that it is. Flemming has lately announced the discovery in the resting nucleus of a very fine network in connection with the coarser one previously known. He also declares that the nuclear membrane is really composed of minute flat plates of chromatin continuous with the fibrils of the network. These are separated by slight intervals, so that the membrane appears to be pierced with holes which are possibly occupied by the transparent ground substance. Others deny the existence of a nuclear membrane. Dr. Pfitzner has recently declared that the chromatin fibrils are not homogeneous in structure, but that they really consist of minute spherules of chromatin, connected by some other substance, probably achromatin.

These observations point to a possible solution of the disputed questions. The chromatin—which is probably the active element—of the original nucleus becomes first regularly arranged around the nuclear centre, then divides in the plane of the equator, and recedes to the poles to form the nuclei of new cells. As it recedes, achromatin fibrils appear, which, if Pfitzner's observation prove correct, may be the bared basal lines of the fibres after their chromatin has gathered at the poles. The disks of the equatorial plate may also be a portion of this chromatin which has remained in the centre of the spindle. And if Flemming's last-mentioned observation be confirmed, it will indicate that the fibrils of the nucleus resemble those of the nuclear spindle in having chromatin disks at their extremities, laid side by side over the surface of the nucleus. During the resting stage, however, this localization of the chromatin at centre and surface is apparently lost. It seemingly becomes diffused throughout the nucleus, as is indicated by all the substance of the latter now taking the stain.

In the other forms of cell-division probably similar phenomena occur. We know that they do in one instance of cell-budding, that by which the polar bodies of the animal ovum are formed. In this case a nuclear spindle is formed centrally, then moves to the side of the cell and protrudes one pole through the cell-membrane. This is constricted off to form the polar body. If completely separated it would probably represent a free bud. The remaining pole of the spindle returns to the centre of the cell and resumes the nuclear condition. The process resembles ordinary cell-division in all particulars, with the exception that the two new cells differ greatly in size.

The division of the vegetable cell fails to display the well-marked changes above described, yet it presents other features not seen in the animal cell. Instead of definite movements of chromatin fibrils, there are vague motions of the cell-protoplasm which distantly resemble those described. As Strasburger details the process, it begins with a massing of the contents of the nucleus in its equatorial region. It assumes a spindle shape, with this dark mass placed centrally and clear areas extending to its poles. He calls the central mass the *nuclear plate*. It soon splits, and its two halves retreat to the poles. In many plant-cells this preliminary phase of division is not apparent. The remainder of the process we give as recently described by J. M. Macfarlane from observations on the cells of *Spirogyra:* Division of these cells begins with an aggregation, on opposite sides of the nucleus, in a line with the long axis of the cell, of a quantity of pale, slightly granular protoplasm. In the interior of the nucleus a mass of darker protoplasm soon appears at either pole, though there is no evidence that these masses come from the centre, as in the cases described by Strasburger. These polar masses push through the membrane of the nucleus, and combine with the outer aggregations of pale protoplasm to form two dark, amœboid lumps. From these polar masses fibres run inward and outward.

The cells of *Spirogyra* contain a large and well-defined nucleolus, which apparently possesses a smaller interior body, called by Mr. Macfarlane the *nucleolo-nucleus*. These bodies take part in the division process. The nucleolus swells and the nucleolo-nucleus divides into two. In the next stage the nuclear membrane disappears, and a spindle of fibres, running inward from the poles to the nucleolus and bordered by darker fibres which run from pole to pole, appears. This composes the *nuclear barrel*. Next the nucleolus divides, and its two halves move toward the poles. At the same time the nuclear barrel lengthens and widens, as if some repulsive zone acted from the centre. In time the nucleoli reach the polar masses, and penetrate them. Thus are formed the rudiments of new nuclei. As the nucleoli recede, fibres extend between them, until there is formed a figure resembling the nuclear spindle already described. The remaining process is like that of the animal cell. An *equatorial plate* is formed and divides into two, between which there pushes in from the cell-membrane a wall of cellulose. This thickens and deepens until it reaches the centre, and forms the dividing-wall of the two new cells. The swelled-out lines of the nuclear spindle contract, but they continue visible after the division is accomplished. The polar masses secrete new membranes, and assume the condition of nuclei of the new cells.

This process of division seems analogous to, though not identical with, that of the animal cell. Perhaps it is a more primitive mode. In it the nucleolus appears to play an important part, while in the animal cell the nucleolus seems unimportant. On the other hand, the transformations of the fibrous network seem much more declared in animal than in vegetable cells. Apparently, in animal tissues the cell-fibres attain a more developed condition than that above indicated. They extend, in certain cases, beyond the superficies of the cell and connect it with adjoining cells. This condition has been observed in epithelial cells. Heitzmann declares that it exists in all cells, and that in many tissues the cell-structure disappears, and only central nuclei persist, from which outreach long, inosculating fibres of protoplasm, combining the whole body into a living network. This announcement, however, is questioned.

Yet in certain tissues this fibrous outgrowth of cell-structure is undeniably present. It exists in the cells of nerve-ganglia as delicate hairs or rootlets. These are probably prolongations of the inter-cell fibrils, and they appear to form the gangliar termination of the sensory nerves, being gathered into fibrous bundles and surrounded by a medullary sheath. The motor nerves, on the contrary, appear to leave the cells as distinct, single fibres. In the outward terminations of the nerve-fibres there are indications of a similar continuation with cell-fibrils. The delicate endings of the nerves enter cell-like structures in many of the sensory nerve-endings. In the muscle terminations of the motor nerves a similar condition appears. Gerlach asserts that in the voluntary or striped muscles the nerve ends in minute fibrils, which penetrate the muscle-cells. In the unstriped muscles the nerves subdivide to form a very delicate intra-muscular network. Frankenhauser traced minute fibrils from this network into the substance of the muscle-cell, ending, as he believed, in its nucleolus. But Arnold asserts that a filament is continuous through the cell and rejoins the network without. Thus the cell-nucleus, or nucleolus, seems to be the nodal point of a fine intra-muscular network of nerve-fibrils.

These facts seem to show an intimate relation between the cell-fibril and the nerve-fibre, and indicate that the former is the primitive form of the latter. In the evolution of animal structure it is possible that the cell-fibril became prolonged beyond the cell-surface, possibly serving as a sensitive prolongation, and eventually developed into the nerve, which in the higher animals is the connecting link between cell-masses, and particularly between the muscular, the epithelial, and the ganglionic organs of the body. This view is hypothetical, yet it points in the direction to which discovery seems tending. Certainly, the fibre, as an element of cell and of animal structure, is growing into greater importance with every new advance in microscopic discovery. (C. M.)

CELLULOID, an artificial material used in the arts as a substitute for ivory, horn, amber, and other natural products. Materials resembling celluloid have been made under various names since 1855, both in Europe and the United States. All the methods of making it, whether it is called parkesine, xylonine, or celluloid, are essentially the same. Cotton or other vegetable fibre is treated first with acids to produce pyroxyline, and this is treated with camphor and other solvents to produce a solid elastic substance that resembles ivory. None of the experiments appear to have been commercially successful until 1869. In that year J. W. Hyatt, Jr., and I. S. Hyatt obtained a patent on an improved method of treating pyroxyline, and soon after the name "celluloid" was applied to the material as now manufactured. Since that time over ninety patents have been obtained on the applications of celluloid, the process of making it, and the machinery used in its manufacture. All the celluloid produced in the United States is made by one company, and in Newark, N. J. The celluloid used in Europe is made by an associate company at Paris. All the processes are patented, and the details of the manufacture are held as trade secrets. The quality of the material has been steadily improved and its cost greatly reduced. This has led to its general introduction, and it is now used in large quantities in nearly every trade. The basis of celluloid is a fine quality of tissue-paper submitted to the action of sulphuric and nitric acids. The solvents and coloring-matter are added to the pyroxyline under the influence of steam heat and pressure. It can be moulded into any form by steam ranging in temperature from 212° to 300° Fahr., and can be planed or turned into thin sheets when cold.

In appearance, crude or uncolored celluloid is of a pale yellow color both by reflected and transmitted light, and in thin sheets is quite transparent. It resists hot and cold water and the more common acids and alkalies.

It can, however, be dissolved in strong alcohol or spirits of camphor. Celluloid is hard, tough, elastic, and slightly heavier than water. It burns freely with a bright flame and black smoke, and leaves a white ash showing a fibrous character. It can be polished, sawn, turned, carved, and planed, and is plastic under heat and pressure. The addition of coloring-materials causes it to resemble parchment, jet, shell, ivory, bone, tortoise-shell, agate, coral, amber, malachite, and other natural products. It is much stronger than some of these, and lighter and less liable to warp and split or tarnish under the influence of the atmosphere. The colors are permanent, and the material is more durable than the natural substances it is designed to replace. It is stronger than hard rubber, though somewhat more costly.

Celluloid was first used as a substitute for ivory in making billiard-balls. Its many valuable properties quickly led to other uses, and it is now used in place of horn, shell, bone, amber, wood, paper, and glass. It is used in making imitation jewelry, piano-keys, knife, mirror, brush, and umbrella handles, harness trimmings, rulers, chessmen, and parts of musical, dental, and photographic instruments and apparatus. Its lightness, cleanliness, and readiness to take color and polish led to its introduction as a substitute for linen in cuffs and collars, and it is largely used for this purpose. By the latest methods of manufacture linen is covered on both sides with a transparent film of celluloid, and the finished goods have all the appearance of linen. Celluloid is also used as a basis for emery-wheels and a foundation for pearl and other buttons. (C. B.)

CEMETERIES IN AMERICA. See Vol. V. p. 286 Am. ed. (p. 328 Edin. ed.). The present mode of disposing of the remains of the dead in the United States is, with few exceptions, inhumation, or committing the bodies to the earth. Comparatively few are placed in vaults, catacombs, or brick graves, while a still less, and quite inconsiderable, number are disposed of by incineration, although great efforts have been made during the past decade to introduce cremation in America as well as in Europe.

Cemeteries in America are conducted on various plans. A number of these are under the control of city authorities, while others are the property of religious communities. The largest and most successfully managed of these institutions are, however, those established by private enterprise, where every owner of a family burial-plot is a member of the corporation, and where the entire income is devoted to the improvement and perpetual care of the grounds.

While large European cities have thousands of acres devoted to splendid public parks, none has a rural cemetery that will compare with those near Boston, Philadelphia, New York, or Cincinnati. During the past quarter of this century the American cemeteries have justly gained the reputation of being the most beautiful in the world. The practice of substituting the creations of the art of landscape-gardening for the bleak and neglected aspect of a mere graveyard was adopted in America about the same time as it began to obtain in England.

We shall here mention briefly the principal cemeteries of the United States and Canada.

New England.—Mount Auburn Cemetery, near the city of Boston, was established in 1831, and is, consequently, the first rural cemetery of any importance on the American continent. It contains an area of 125 acres of native woodland, with (at this time) over 23,000 interments. The principal eminence of this area, which is crowned with a round tower 62 feet in height and built of smooth hammered granite, serves as a landmark by which this cemetery can be identified from a great distance, and commands one of the finest prospects in the environs of Boston. The large number of costly monuments erected on individual lots shows the interest which the people of Boston take in their pioneer cemetery. The largest cemetery, however, in the vicinity of Boston is Forest Hills, established in 1848. It contains over 200 acres of beautifully situated grounds, with over 18,000 interments up to this time. Woodland Cemetery contains 100 acres, and was dedicated as a place of burial in 1851. Cedar Grove and Mount Hope cemeteries are under the care of the city authorities, the former containing 40 acres and the latter 100 acres. The Newton Cemetery is also situated near Boston. It contains 80 acres, and was established in 1860.

Cedar Hill Cemetery is located about 3 miles from the city of Hartford, Conn. The grounds were laid out by Jacob Weidenmann in 1865, and consecrated to burial purposes in 1868. It contains an area of 254 acres of beautifully situated grounds. Many substantial and tasteful improvements have been made by the corporation as well as by the owners of lots.

Swan Point Cemetery, near the city of Providence, R. I., was incorporated in 1858, and contains an area of 250 acres of undulating and diversified grounds, with many beautiful improvements.

Evergreen Cemetery, at New Haven, Conn., was dedicated in 1849, and contains about 40 acres.

New York.—Greenwood Cemetery, on Long Island, near Brooklyn, was incorporated in 1838, but no interment was made till 1842. The grounds comprise 450 acres, and over 210,000 interments have been made within its precincts. In natural beauty, elaborate improvements, and costly monuments it is the first cemetery in the United States. Twenty miles of avenues and seventeen miles of footpaths have been constructed, and over 45,000 monuments and headstones have been erected to the memory of the dead. This cemetery has five entrances. The northern or main entrance is built of New Jersey freestone, and is 132 feet long by 40 feet in depth, with a central pinnacle 106 feet in height. The office-buildings are connected with this entrance. The most noted monuments to be seen here are the Firemen's, the Soldiers', the Pilots', De Witt Clinton's, Horace Greeley's, etc. Magnificent views can be had from these grounds, including the metropolis, New York harbor and bay, and the ocean beyond.

Woodlawn Cemetery, situated on the Harlem Railroad near the junction of the New York and New Haven Railroad, contains 400 acres. Since the date of its organization (1863) there have been, up to this time, over 18,000 interments. The improvements on these grounds are chiefly made in accordance with the park or lawn plan. The grounds, like most of the other burial-places in the United States, are exempted from assessment and public taxes. Cypress Hill Cemetery is located on Long Island, and comprises nearly 400 acres. This cemetery was dedicated in 1848, and by its charter is permitted to hold 500 acres of grounds. Over 110,000 interments have been made since its organization. Evergreen Cemetery is situated about 3 miles from Brooklyn. It was opened for burial purposes in 1851, and contains 340 acres, with over 66,000 interments. Calvary Cemetery is the principal Roman Catholic cemetery in the vicinity of New York, and over 400,000 bodies have been interred therein since it was opened in 1848. The grounds cover an area of more than 100 acres, and are divided into ten sections. The Soldiers' Monument, erected by the city of New York in 1866, is a conspicuous feature of this cemetery. The Lutheran Cemetery was established in 1852 by the united Lutheran churches of New York, and over 100,000 interments have been made since its dedication. The cemetery company holds 400 acres of ground for burial purposes, one-half of which is already improved. There are many smaller cemeteries in the vicinity.

Near the city of Albany there is an extensive rural cemetery, with over 24,000 interments. On the Hudson River, near the city of Troy, is situated one of the largest and best-kept cemeteries of the State, known as Oakwood Cemetery. Forest Lawn Cemetery is situated near the city of Buffalo. It was dedicated in 1850, and contains an area of 250 acres, covered with large forest trees. Mount Hope Cemetery, near Rochester, was established in 1845, and is situated near the southern part of the city. Forest Hills Cemetery, near Utica, is also worthy of mention. The most noted improvement on these grounds is the conservatory chapel, which is used for funeral services in inclement weather.

Pennsylvania.—In 1836, John Jay Smith, in company with a few other enterprising citizens of Philadelphia, laid out on the banks of the Schuylkill the now far-famed Laurel Hill Cemetery, which contains about 80 acres. It was then 3 miles N. of the city, but is now within the city limits, though not yet approached by buildings. The same company in 1869 established West Laurel Hill, which contains over 200 acres of still more beautifully situated grounds, and, like the other, has proved very attractive. Both contain a large number of elegant monuments. Mount Peace and Mount Vernon cemeteries, immediately adjoining Laurel Hill Cemetery, are also handsomely improved. Woodlands Cemetery is on the W. bank of the Schuylkill, and was laid out in 1851. Mount Moriah Cemetery, south-west of the city, has good grounds which are steadily improved.

Allegheny Cemetery, situated near the city of Pittsburg, is the largest rural cemetery in the State of Pennsylvania. It was established in 1845, and contains 360 acres. The improvements on the grounds are made much after the style of the older cemeteries near the Eastern cities. The view presented to the eye of the beholder in all directions from the highest point in this cemetery is surpassingly beautiful, including the Allegheny and Monongahela rivers.

New Jersey.—Fairmount Cemetery, near Newark, is probably the best known burial-place in this State. It was incorporated in 1855, and contains about 60 acres of dry and sandy soil.

Southern States.—Green Mount Cemetery, near the city of Baltimore, was dedicated in 1839. The principal improvement on these grounds is the chapel, constructed of brown sandstone at a cost of $30,000.

Oak Hill Cemetery is situated at Georgetown, D. C., about 2 miles from Washington City, and was incorporated in 1849. The grounds contain an area of 35 acres, and are the best kept in the vicinity of the national capital. Many beautiful monuments have been erected within its borders, also a Gothic chapel for funeral services.

Hollywood Cemetery, at Richmond, Va., has been used as a burial-place since 1847, and contains at this time an area of 95 acres of undulating surface, well covered with native forest trees. The name Hollywood is due to the prevalence of the holly trees which grow here to great perfection. The *Magnolia grandiflora* also flourishes here, and contributes much to the beauty of the landscape. In these grounds over 20,000 interments have been made.

Magnolia Cemetery, just N. of Charleston, S. C., is the finest in that vicinity, though many distinguished citizens are buried in the graveyard attached to St. Philip's Church in the city.

Bonaventure Cemetery is situated on a branch of the Savannah River, about 4 miles from the city of Savannah, Ga. One hundred years ago it was the country-seat of a wealthy gentleman, and was laid out with wide avenues and planted with native live-oaks. It has since become the burial-place of the prominent families of Savannah, whose memorial monuments add to its solemn beauty.

The cemeteries of New Orleans are especially notable. Owing to the very moist nature of the soil the tombs are placed above ground; most of them are structures about 8 feet high, consisting of cells just large enough to admit a coffin. After the funeral ceremonies are performed the opening is bricked up, and generally a marble tablet with appropriate inscription is placed over the vault. Some of the tombs are elaborate structures of marble. The cemeteries beyond the city limits are beautiful with the magnolia, cypress, and willow trees, as well as abundance of flowers. On All Saints' and All Souls' Days (Nov. 1 and 2) the people of New Orleans visit the cemeteries and deck the tombs with flowers, immortelles, and other tokens of remembrance.

Elmwood Cemetery is probably the best known burial-ground in the State of Tennessee. It is situated near the city of Memphis, was incorporated in 1852, and contains about 80 acres of woodland, chiefly oak and elm. Mount Olivet Cemetery is situated near Nashville, and is the next largest cemetery in that State.

Cave Hill Cemetery, near Louisville, is the largest and best kept cemetery in the State of Kentucky. It was incorporated in 1845, and contains over 200 acres of well-improved grounds. Individual burial-lots are, in most instances, surrounded by low stone walls. The cities of Frankfort and Lexington in the same State have also large and well-kept cemeteries.

Ohio.—Spring Grove Cemetery, near Cincinnati, was opened for burial purposes in 1845. It now contains an area of 600 acres, and is therefore the largest cemetery in America. The original plan of improvement was made by the late John Notman, much after the style of Laurel Hill Cemetery at Philadelphia, of which he was also the designer. Since 1854 the improvements have been conducted on a new plan, known under the name of the "park system," introduced by A. Strauch. The numerous springs and ancient groves of trees suggested the name of Spring Grove. Although surpassed in the costliness of her monuments by many other cemeteries, yet to the lover of nature Spring Grove is more delightful and satisfactory. Its undulations of green turf, its broad avenues, and its rare and stately trees unite the elegance of a park with the pensive beauty of a burial-place.

Lake View Cemetery, situated near the city of Cleveland, is the next largest burial-place in the State of Ohio. It was laid out in 1870, and contains the remains of President Garfield. This cemetery takes its name from the beautiful views obtained of Lake Erie from its highest point. Riverside Cemetery is also located near this city, and was dedicated in 1875. Woodlawn Cemetery is situated near the city of Toledo, and is of still more recent origin.

Indiana.—Crown Hill Cemetery, near the city of Indianapolis, is the largest and best-kept cemetery in Indiana. It was dedicated as a burial-place in 1863, and contains an area of 360 acres of mostly level ground.

Missouri.—Belle Fontaine Cemetery is situated near the city of St. Louis. It contains an area of 332 acres of beautiful woodland, chiefly oak. It was established in 1849, and is the largest and best-known cemetery in the State of Missouri.

Michigan.—Near the city of Detroit is Woodmere Cemetery, which was established in 1869, and contains an area of 200 acres of grounds well adapted to the purposes for which they have been consecrated.

Illinois.—In the environs of Chicago we find three large rural cemeteries. Rose Hill Cemetery, established in 1859, is situated on the Milwaukee division of the Chicago and North-western Railroad, and contains about 250 acres. Graceland Cemetery, fronting on the Green Bay road, was incorporated in 1861. Oakwood Cemetery was established in 1864, and contains about 300 acres. It is situated on Cottage Grove Avenue. Oak Ridge Cemetery is situated near the city of Springfield. It was consecrated in 1860, and contains 75 acres of woodland. In these grounds is the mausoleum containing the remains of the martyred President, Abraham Lincoln.

Wisconsin.—Forest Home Cemetery, situated near the city of Milwaukee, contains an area of 200 acres. These grounds are laid out with great taste and skill, and are approached by a wide avenue.

California.—Lone Mountain Cemetery was the original burial-place in the vicinity of San Francisco, and is in many respects unsurpassed for splendid location, particularly in the beautiful views over the city, bay and ocean. Mountain View Cemetery is situated near Oakland, and was laid out by Fred. Law Olmsted in 1865. It is a burial-place for Protestants, Catholics, and Hebrews. Laurel Hill Cemetery is another of the principal burial-places in the vicinity of the Golden Gate City.

Canada.—Mount Royal Cemetery is at this time the largest and best-kept rural burial-place in the Dominion of Canada. Situated about 2 miles from the city of Montreal, it contains an area of 217 acres of beautifully undulating grounds. This cemetery was established in 1851, and over 22,000 interments have been made within its boundaries since that time. Many substantial improvements have been made on private burial-lots; most of them, however, are surrounded with various kinds of enclosures, as was formerly the case in the older cemeteries in the United States. The buildings at the entrance to these grounds contain the residence of the superintendent, also rooms for the transaction of the business of the cemetery and the accommodation of visitors. One large room is also provided for occasional funeral services. In consequence of the extreme cold weather during the winter months the remains of the dead are deposited in two spacious public vaults situated a short distance from the entrance, where they remain until spring.

Mount Hermon Cemetery is situated about 3 miles from the city of Quebec. It was chartered in 1848, and contains 35 acres, with over 6000 interments. Many private lots are adorned with costly monuments and tombs. As is the case in Montreal, the dead are here also deposited in a vault during the winter, awaiting final interment in the spring.

Nearly all of the public places to which we have referred, usually termed rural or garden cemeteries, are very favorably situated and well managed. A large number of them are, however, sadly disfigured by objects that should find no place among the homes of the dead. Permitting owners of lots to enclose their burial-plats separately, either with wood, stone, iron, or hedge fences; to erect as many tombstones therein as they please; to plant, indiscriminately, all sorts of trees, shrubs, and flowers, and otherwise encumber the graves of their dead with varieties of objects and puerile ornamentation,—has cost many cemetery associations large sums of money, besides defacing and destroying their otherwise beautiful grounds. This style of promiscuous and tasteless decoration of the resting-places of the dead is also very much calculated to pervert taste and imbue the minds of the people with false ideas. To escape these defects in the adornment of our rural cemeteries, the board of directors of Spring Grove Cemetery, near Cincinnati, in 1856, at the suggestion of Adolph Strauch, recommended to the owners of lots certain reforms, which, although at first much opposed, have since been gradually carried into effect, not only in Spring Grove, but also in several other cemeteries throughout the country. The object of these reforms is to reconcile the essential requirements of a rural burial-place with true landscape art, and thus to realize as far as possible the ideal of a rural cemetery. The suggestions of Mr. Strauch were these:

1. No individual burial-lot should be enclosed by any kind of fence, but proper landmarks should be substituted, bearing the name of the owner and the number of the lot thereon, to be placed at each corner of the lot and level with the surrounding grounds.

2. In order to prevent the unsightly crowding of tombstones, which gives many of our best cemeteries the appearance of a stone-cutter's establishment, only one monument may be erected in the centre of each lot, so that the graves of the family can be located around the monument, thus saving the expense of head- and foot-stones to each grave. When, however, grave-marks or index-stones are desired, they are to be placed at the foot of the graves, and not project above the surface of the grounds more than the usual height of the grave-mound (about three or four inches), with the name of the deceased on the top of the stone.

3. The planting of trees and shrubs should be entirely under the control of the cemetery authorities. It was also suggested to reserve all corner lots at the junction of avenues for the planting of deciduous forest trees, in order to overcome the monotony produced by the usual planting of evergreens on burial-lots, thus affording visitors shady locations at proper distances. As most of the cemeteries in the vicinity of the larger cities in the United States contain the remains of persons from various parts of the world, the trees of their respective countries might also, very appropriately, be planted over or near their graves. In the course of time there would thus be formed extensive arboretums, which would be far more attractive as well as instructive to succeeding generations than a collection of dilapidated tombstones.

In Spring Grove Cemetery a number of prominent citizens have planted a memorial tree instead of erecting a monument in the centre of their family burial-lots, and located the graves around the same. Many beautiful specimens of the scarlet, the laurel, and the white oak are found as monumental trees on individual lots. "Among the various productions with which Nature has adorned the surface of the earth," says the eloquent author of *Sylva Britannica*, "none awake our sympathies so powerfully as those venerable trees which have stood the lapse of ages, silent witnesses of the successive generations of man, to whose destiny they bear so touching a resemblance alike in their budding, their prime, and their decay." (A. S.)

U. S. National Cemeteries.—In 1850, Congress appropriated $10,000 to provide a cemetery near the city of Mexico for American soldiers who had fallen in battle or died in or near that city, and for the interment of American citizens who might die in Mexico. In the following year two acres of ground were purchased, enclosed, and laid out, about 470 interments being made. Little else was done to this cemetery until recent years. Early in the course of the War for the Union, Congress, responding to the feeling of the people, directed national cemeteries to be provided for soldiers who should die in the service of the country. This direction was repeated at the close of the war, and fully carried out under the supervision of Major-Gen. M. C. Meigs, Q. M. G. Portions of the great battlefields of the war had already been used for the burial of the dead, and these were now enclosed and laid out under general regulations, care being taken to identify and mark the graves as far as possible. In other cases ground was purchased by the Government, and the bodies of Union soldiers were gathered from several fields into one cemetery. Superintendents are appointed to take care of the grounds and show proper attention to visitors. They are selected from among the honorably discharged disabled soldiers. The cemeteries under the exclusive control of the national authorities, besides the one in Mexico City, are chiefly in the Southern States, and are distributed as follows: Virginia, 17; Tennessee, 7; Kentucky, 6; Louisiana, Maryland, Illinois, North Carolina, each 4; Mississippi, Arkansas, Missouri, each 3; District of Columbia, South Carolina, Georgia, Florida, Texas, Kansas, Indiana, New York, Pennsylvania, New Jersey, each 2; West Virginia, Alabama, Iowa, Nebraska, Montana, Indian Territory, each 1; total 82. Those having the most numerous interments are as follows:

Andersonville, Ga	13,714	Memphis, Tenn	13,977
Antietam, Md	4,671	Mound City, Ill	5,226
Arlington, Va	16,264	Nashville, Tenn	16,526
Beaufort, S. C	9,241	New Berne, N. C	3,254
Corinth, Miss	5,716	Pittsburg Landing, Tenn	3,590
Chattanooga, Tenn	12,962	Poplar Grove, Va	6,199
Chalmette, La	12,511	Port Hudson, La	3,819
Fredericksburg, Va	15,257	Richmond, Va	6,542
Gettysburg, Pa	3,575	Salisbury, N. C	12,126
Hampton, Va	5,424	Soldiers' Home, D. C	5,602
Jefferson Barracks, Mo	11,490	Stone River, Tenn	6,145
Little Rock, Ark	5,602	Vicksburg, Miss	16,600
Marietta, Ga	10,151	Winchester, Va	4,459

The total number of interments is 321,369, including 173,088 known and 148,281 unknown. There are about 6900 known and 1500 unknown civilians, and 6100 known and 3200 unknown Confederates. Of the latter, the greater number are buried at Elmira, N. Y., and at Finn's Point, near Salem, N. J. Deducting these, there are gathered in the national cemeteries the remains of nearly 300,000 men who yielded up their lives in defence of the Government which now guards their last resting-places.

The *Congressional* Cemetery at Washington, D. C., belongs to Christ Church (Episcopalian), Congress having purchased several lots in it to provide a burial-place for members. The first burial was in 1807, and the last permanent one in 1864.

CENSUS. The census of 1880 was the tenth census taken under the direction of the government of the United States. It was authorized and regulated by an Act of Congress approved March 3, 1879, which required that "a census of the population, wealth, and industry of the United States shall be taken on or for the date June 1, 1880." The act fixed the cost of the work at $3,000,000, but a much larger sum was required for the completion of the task, the amount thus far appropriated by Congress for the uses of the Census Office being $4,651,596.

See Vol. V. p. 290 Am. ed. (p. 334 Edin. ed.).

All censuses of the United States previous to that of 1880 were taken by the aid of the United States marshals. The objections to the performance by the marshals of the functions of Census officers were many and serious, and a new method was devised for the collection of statistics in 1880. The law required that an office to be called the Census Office should be established in the Department of the Interior, and that the chief officer, to be entitled Superintendent of the Census, should be appointed by the President, and be charged, under the direction of the Secretary of the Interior, with the duty of superintending the taking of the census. The Superintendent so chosen was Francis A. Walker, of Massachusetts, who, however, resigned before the completion of the work, and was succeeded by the chief clerk of the office, C. W. Seaton, of Washington, D. C. Subsequently the illness of Mr. Seaton compelled the recall of Mr. Walker, under whom the final compilations were made. The salary of the Superintendent was fixed at $5000 a year, and provision was made for discontinuance of the office upon completion of the work of the census.

The Secretary of the Interior was required, on or before the first day of March, 1880, to designate the number of supervisors of Census (taking the places of the marshals) to be appointed in each State and Territory. It was declared that the total number of supervisors should not exceed one hundred and fifty, and that each should reside in the State or Territory in which he was to operate. Upon each supervisor devolved the duty of proposing to the Superintendent of the Census the apportionment of his district into subdivisions most convenient for purposes of enumeration; of selecting, with the consent of the Superintendent, suitable persons to make the enumeration; of giving necessary instructions to these persons, and of transmitting to the main office the returns procured by the enumerators. Each supervisor, also, was required to examine the returns critically, and to correct any errors detected by him in the work, whether of omission or commission. The law designated five hundred dollars as the amount that should be paid to each supervisor in compensation for his labor.

The enumerators were charged with the task of visiting each dwelling-house and family in each subdivision, of seeking out each individual not connected with a family, and of procuring exact answers to all the questions upon the schedules. Indians not taxed were not counted in the general enumeration of the population, but were looked after by special agents. The enumerators were paid as follows: in subdivisions where the Superintendent deemed such an allowance sufficient the compensation was fixed at two cents for each living inhabitant counted, two cents for each death reported, ten cents for each farm, and fifteen cents for each establishment of productive industry enumerated and returned. No claims for mileage and travelling expenses were allowed in such subdivisions, and the time consumed by the enumerators was not at all considered in estimating their pay. For all other subdivisions the compensation of enumerators was adjusted with reference to the nature of the region canvassed, and the density or sparseness of settlement; but the law expressly declared that "the compensation allowed to any enumerator in any district east of the one-hundredth meridian shall not exceed an average of four dollars a day of ten hours' actual field work, each; and the compensation allowed to any enumerator in any district west of the one-hundredth meridian shall not exceed six dollars a working day of equal length."

It was required that no subdivision should have a population in excess of four thousand, according to the census of 1870, with this exception: that in the States and Territories admitted to the Union since 1870, the Supervisors were allowed to appoint additional enumerators in cases where, in their judgment, the census could not properly be taken in thirty days, by reason either of the increase of population, or of the physical features of the district.

The boundaries of all subdivisions were required to be clearly described by civil divisions, rivers, roads, public surveys, or other lines easy to be distinguished. In accordance with this demand, the Census Office laid down the following rules for the guidance of supervisors in outlining their subdivisions:

1. In no case is a part of one county to be joined in an enumeration district, with another county, or any part thereof.

2. In no case will a town (New England), or township (Middle and Western States generally), or ward of a parish (Louisiana), or militia district (Georgia), or "hundred" (Delaware), or election district, or magisterial district, or precinct, or beat, be joined, in an enumeration district, with a fractional part of another town, or township, or militia district, etc. In the cases (mainly found in the newly-settled States) where more than one such civil division is taken to form an enumeration district, the whole of each of such civil division so taken must be included.

3. In general, every town, township, militia district, or other permanent civil division of the county, should be constituted an enumeration district, if the estimated population thereof exceeds seven or eight hundred inhabitants. The only reason which the Census Office could recognize as sufficient for making such a civil division a part of a larger enumeration district, would be the impossibility of securing a competent and trustworthy enumerator within its own limits.

4. The enumeration districts must be made small enough to secure the completion of the canvass within the time set by Congress. To this end, supervisors will be expected to exercise their best judgment in good faith. The number of inhabitants who can be enumerated within the time allowed by the law, will vary greatly according to the geographical conditions of the district and the density or sparseness of settlement. In rich agricultural regions 2000, 2500, or even 3000 inhabitants may safely be embraced in an enumeration district. As settlements become more sparse, and the difficulty of travel increases, a smaller amount of population should be embraced within enumeration districts; for which purpose it will frequently be necessary to divide militia, election, or magisterial districts, beats, precincts, or wards of parishes, in States where the town or township system does not exist; and it may sometimes be found necessary to divide towns and townships to secure prompt enumeration. Wherever this is done, the division should be by some clearly-marked boundary, as a stream or a county road. It is of more importance that the line of demarcation should be clear and unmistakable than that the two districts thus formed should be exactly equal, either in territorial extent or in the amount of population.

5. In cities having over 10,000 inhabitants by the census of 1870, . . . an active, intelligent enumerator can easily take from 200 to 300 names per day, at least after the first day or two. The enumeration districts, therefore, may be safely made to embrace an estimated population of from 2000 to 2500. They should seldom be allowed to exceed the higher number.

The Census Office suggested to Supervisors that certain classes of persons might be regarded as having special qualifications for the performance of the duties of enumerators. Township assessors and other local officers were named as likely to make good enumerators, because they are acquainted with the names, residences, occupations, and personal characteristics of the people of their respective townships. Postmasters at small offices, country physicians, and schoolmasters were mentioned as being also well qualified for the work.

The law imposed penalties upon Supervisors and enumerators for neglect of duty, for receiving fees or rewards, and for making false returns; and upon persons over 20 years of age who should refuse to give to the proper officers the information asked for.

It was declared that the work of enumeration for the census of 1880 should begin on the first Monday of June, and should be completed, so far as it related to population, on or before the first day of July next following; but in cities having over ten thousand inhabitants the enumeration was to be completed within two weeks from the first Monday in June. The purpose of the law in this respect was fulfilled, and the census of population was taken in a shorter time than ever before in the history of the country. The only delay that occurred was caused by a recount of the population of the State of South Carolina and of the city of St. Louis, because of complaint that serious injustice had been done in the first enumeration.

Some facts respecting the time occupied in the enumeration in previous years may be pertinent here. After the taking of the census of 1790, the first United States census, the reports made by the marshals were dated variously from May 4, 1791, to September 19, 1791, excepting that the South Carolina report was dated February 5, 1792. The Secretary of State published his report of the whole, South Carolina excepted, under date of October 24, 1791. The State reports of the census of 1800 vary in date from August, 1800, to December 21, 1801, and the report of the Secretary of State was dated December 8, 1801. The State reports of the census of 1810 were not all returned until 1811. Those of the census of 1820 extended to September 1, 1821, and the Government report was dated December 18, 1821. In 1830, the enumerators began in June, and were allowed until February, 1831, to collect and report their facts. By act of February 3, 1831, this time was extended to August, 1831. The general report was dated January 16, 1832. The general report of 1840 was printed in 1841, the precise date not being ascertainable. The first short summary report of the census of 1850 was made to Congress December 1, 1851. The second was made December 1, 1852, and printed in 1853. The principal report was dated November 10, 1853. The compendium was dated September 1, 1854. The mortality volume was dated November 20, 1855, but the final publications were not made until 1859. The preliminary report of the census of 1860 was dated May 20, 1862. The first large volume, containing the population, was printed in 1864; but the complete publication was delayed until 1866. The law required that the returns of the census of 1870 should be made within one hundred days of the beginning of the enumeration; but this was not the practical result. The last returns came in on August 23, 1871.

There was an intention that the census of 1880 should be made more comprehensive than any that preceded it; and, as a means to this end, the law required that the schedules of inquiries, while conforming generally to those used in the preceding censuses, should be different from them in the following particulars:

Schedule Number One was arranged to contain inquiries as to the relation of each person enumerated to the head of the family, whether wife, son, daughter, servant, boarder, or other; as to the civil conditions of each person enumerated, whether married, widowed, or single; as to the place of birth of each person enumerated; as to all foreign-born, whether alien or naturalized persons; and as to the physical and mental health of each person enumerated, whether active or disabled, maimed, crippled, bedridden, deaf, dumb, blind, insane, or idiotic; and whether employed or unemployed, and if employed, during what portion of the year. It was declared by the law that from this schedule the inquiries as to the value of real and personal estate should be stricken out.

The Superintendent of Census was authorized, with the approval of the Secretary of the Interior, to add to Schedule Number Two, inquiries relating to the acreage of the several crops reported; and, with like approval, to drop from the schedule such of the minor crops as it should be deemed expedient to omit from the enumeration.

Schedule Number Three contained inquiries respecting the kind and amount of power employed in establishments of productive industry, and the kind and number of machines in use, together with the maximum capacity of such establishments, where the Superintendent of Census deemed such inquiry appropriate.

Schedule Number Four contained inquiries relating to the indebtedness of cities, counties, incorporated villages and towns, and school districts; and to the ownership of the public debt of the United States, by whom owned, and the respective amounts. The Superintendent of Census was clothed with power to add to this schedule additional inquiries respecting the ownership of the public debt, as well as the numbers and condition of the pauper and criminal classes.

Schedule Number Five contained inquiries as to the birthplace of the father and mother of each person reported as having died during the year, and as to the usual occupation of each such person.

Special and novel inquiries were made, also, respecting railway companies, telegraph companies, express companies, and companies engaged in marine, fire and life insurance. The purpose of the law was that these should be minute. The following facts were demanded from every railroad corporation or the lessee or receiver thereof: the name of the corporation or company, with the corporate name of all leased lines; the number of miles of road projected or authorized by law or charter, with the several terminal points of the same; the number of miles completed, exhibiting separately the number of lines within each State; the number of miles operated during the last complete fiscal year preceding June 1, 1880; the capital stock allowed by law or charter, and the amount paid up; the amount of funded and unfunded debt, with the period of the funded debt and the rate of interest thereon, and the amount of all sinking funds provided for the redemption of such debts; the number of acres of land, derived from public grants, remaining unsold; the total cost of construction, of equipment, and of all permanent investments, including the cost of purchase of other lines of road, and of telegraph lines; the amount and character of rolling stock; the number and class of employés; the receipts of such corporation or company for the last complete fiscal year preceding June 1, 1880, exhibiting separately the earnings from through freight, from local freight, from passengers, from expresses, and from mails; the expenses of said corporation or company for said fiscal year, exhibiting separately the amount paid for salaries and wages, for fuel, for national, state, and municipal taxes, for interest on bonds and other debts, for dividends, for repairs, for damage to freight, and for personal injuries; also, the operations of the said fiscal year, including the mileage of freight, of passengers, and of construction and repair trains separately; the number of passengers carried, and the amount and class of freight transported each way; also the number, character, and, so far as ascertained, the cause, of all casualties by which life was lost, which occurred on or within the trains, tracks, or buildings of the corporation or company during said fiscal year, and the extent of injury to life and limb resulting therefrom; also, the terms of all agreements and contracts by which sleeping cars, palace or parlor cars, so called, express cars, and cars of transportation companies not identical with the corporation or company making the return required, are run upon such road or roads; and the extent of such service and the amount of all receipts therefrom during the said fiscal year.

From the owners, proprietors, and managers of every incorporated express company the following facts were demanded: the name of the corporation or company; the capital paid up; the total capital stock, and to what extent the same has been watered, and how often "corners" have been made on such watered stock; the length of lines in miles; whether the business was conducted by rail, vessel, or otherwise; the total amount paid to railroads or vessels for the use of line or lines; the number of officers; the number of persons engaged in general administration; the number of agents and messengers; the total receipts, and the total expenditures, exhibiting separately the amounts paid for salaries, for repairs, and for general expenses.

The owners or managers of every telegraph company were required to answer the following inquiries: the name of the corporation or company; the terminal points connected; the authorized capital, and the capital paid up; the length of lines in miles; the miles of wire; the number of officers; the number of persons engaged in general administration; the number of persons engaged as telegraph operators; the number of messages transmitted by officers of the United States government; the number of messages transmitted for the press; the number of messages transmitted for private persons; the total number of messages transmitted; the total receipts from messages; the total expenditures of the company, exhibiting separately the amounts expended for salaries, for repairs, and for general expenses.

The officers and managers of life insurance companies were required to respond to the following inquiries: the name of the company, and the amount of capital and of paid-up capital; the number of persons employed in the general administration; the number employed as agents; the total gross assets of the company, exhibiting separately the realized assets, deferred and unpaid premiums, and premium notes and loans; the total liabilities of the company, exhibiting separately losses adjusted and unadjusted, losses resisted, scrip and other dividends, dividends to policy-holders, not applied, re-insurance fund; all other claims, including capital; receipts from cash premiums, receipts from all other sources; total cash expenditures, exhibiting separately the amount paid for losses and claims, dividends to stockholders, dividends to policy-holders, commissions, officers' salaries, medical examiners' fees, national, state, and local taxation, and all other cash expenditures; the amount and character of deposits in each State to secure policy-holders; premium-note expenditures; the number and amount of policies issued during the year; the number of policies terminating during the year; the number and amount terminated by death, by expiration, by surrender, by lapse, by change; the total number and amount of policies in force, and the amount of the premiums; the amount of losses in cash and notes, and the percentage of loss to the total amount of policies in force; the percentage of assets to the risks in force.

Of every fire and marine insurance company the following facts were demanded: the name of the company; the amount of the capital stock; the amount paid up; the number of persons employed in general administration; the number employed as agents; the gross assets of the company; the total liabilities, exhibiting separately the amount of losses adjusted, losses unadjusted, losses resisted, the re-insurance fund; all other liabilities including capital; also, the total receipts, exhibiting separately fire premiums, marine and inland premiums, and receipts from all other sources, including interest, dividends, and rents; also, the total expenditures, including, separately, the number and amount of fire losses, of marine and inland losses, dividends, commissions, officers' salaries, State, national, and municipal taxes, and all other expenses.

Power was given to the Superintendent of Census to withdraw the schedules for manufacturing and social statistics from the enumerators for the several subdivisions, and to entrust the collection of such statistics to experts and special agents to be employed without respect to locality; and he was permitted to employ such experts and special agents to investigate, in their economic relations, the manufacturing, railroad, fishing, mining, and other industries of the country. In pursuance of this plan. expert special agents, so called, were appointed each to collect statistics for the entire country concerning the following industries and subjects: manufacturing statistics of cities; statistics of the mining industries east of the Mississippi river; statistics of the mining industries west of the Mississippi river; statistics of the fisheries; of meat production; social statistics of cities; statistics of Indians not taxed; of forestry and the lumbering interests; of wealth, debt, and taxation; of power and machinery used in manufactures; of the defective, delinquent, and dependent classes; of the cotton culture; of fire and marine insurance; of schools, churches, and libraries; of orchard fruits, hops, and the manufacture of tobacco; of the manufacture of glass and coke, and wages in manufacturing industry; of the quarrying industry of the United States; of the tobacco culture; vital and monetary statistics; statistics of the silk industry; of the production of cereals; of railroad, transportation, express, and telegraph companies; of Alaska, its population, industry, and resources; of newspapers and the publishing interests; of the movement of petroleum; of the production of petroleum; of the manufacture of iron and steel; of the manufacture of wool; of the chemical manufacturing industry; of the factory system of the United States; of ship-building; of manufactures of cotton; of distilleries and breweries; and of steamboat transportation.

There are reasons for believing that the results of this attempt to take parts of the census by expert special agents, each charged with the duty of surveying the operations of a particular industry throughout the whole country, have not been so satisfactory as was expected. The territory covered by each person is so large, and the inquiries are so minute, that there was much risk of omissions, and little chance of thorough revision. The Census Office seems to have been seriously embarrassed by the mass of undigested material thrown into it, and a perfectly satisfactory conclusion of its task has hardly been looked for, as the conviction has grown that it has undertaken a work beyond the reach of its capacity. It may, however, be said that the results of many of the inquiries have assured value, and may be regarded as giving peculiar distinction to the tenth census. In the returns were included, for the first time, statistics of railroads, telegraph lines, and life, fire, and marine insurance, while the bulk of the material collected in the departments of manufactures and agriculture has been double that obtained by any former census. In relation to taxation and public debt, the investigations were extended to embrace details which have never been presented in regard to the indebtedness of any other country in the world.

Another novel feature of the census law of 1879 is that it encourages the State governments to take censuses of their own five years after each federal census is taken. It provides that any State which shall take a census, through its duly appointed officers or agents, during the two months beginning on the first Monday in June of the year which is the mean between the decennial censuses of the United States, and shall use schedules in all respects of form and size and heading and ruling like those used in the census of the United States, and shall make return of such schedules to the Secretary of the Interior on or before the first of September following, shall receive a sum equal to fifty per centum of the amount paid for precisely similar service within such State or Territory at the United States census next preceding, increased by one-half the percentage of gain in population in such State or Territory between the two United States censuses next preceding. Many of the States have already pursued the practice of taking such intermediate censuses at their own cost. Michigan had a census in 1874; Iowa, Kansas, Louisiana, Massachusetts, Minnesota, Nevada, New Jersey, New York, Oregon, Rhode Island, South Carolina, and Wisconsin took censuses in 1875; and Missouri and Nebraska in 1876; but in none of these cases were the schedules used precisely similar to those of the federal census.

The primary object of the census is the apportionment of power; and it was for this purpose that the framers of the federal constitution incorporated in it a peremptory declaration that a decennial census should be taken. When the census returns of 1880 showed the population of the country to be 50,155,783, Congress addressed itself to the task of rearranging the apportionment of representatives. The work was begun in the Forty-sixth Congress, and completed in the first session of the Forty-seventh Congress. The plan proposed in the Forty-sixth Congress by Mr. S. S. Cox, of New York City, was finally adopted, although the number of representatives which he suggested (307) was changed finally to 325. Mr. Cox's plan proposed that after Congress fixed upon the number of members, the whole population, omitting the Territories and the District of Columbia, should be divided by that number, and the quotient should be the basis of representation for each member. But, on the division of the population of the States so as to ascertain the number of members for each State, there would be a residuum. This was not to go unrepresented. The loss in the number of members caused by the fractions, in the several States, was to be compensated for, as nearly as might be, by assigning to the States having the largest fractions an additional member each for its fraction, so as to make up the whole number of representatives.

The law making an apportionment of representatives of Congress among the several States under the tenth census, approved February 25, 1882, provides that after the 3d of March, 1883, the House of Representatives shall be composed of 325 members, to be apportioned as follows:

Alabama,	8	Mississippi,	7
Arkansas,	5	Missouri,	14
California,	6	Nebraska,	3
Colorado,	1	Nevada,	1
Connecticut,	4	New Hampshire,	2
Delaware,	1	New Jersey,	7
Florida,	2	New York,	34
Georgia,	10	North Carolina,	9
Illinois,	20	Ohio,	21
Indiana,	13	Oregon,	1
Iowa,	11	Pennsylvania,	28
Kansas,	7	Rhode Island,	2
Kentucky,	11	South Carolina,	7
Louisiana,	6	Tennessee,	10
Maine,	4	Texas,	11
Maryland,	6	Vermont,	2
Massachusetts,	12	Virginia,	10
Michigan,	11	West Virginia,	4
Minnesota,	5	Wisconsin,	9

The law further provides that whenever a new State is admitted to the Union the representative or representatives assigned to it shall be added to the number 325. and that in each State the number to which such State may be entitled in the Forty-eighth and each subsequent Congress shall be elected by districts composed of contiguous territory and containing, as nearly as practicable, an equal number of inhabitants, and equal in number to the representatives to which such State may be entitled in Congress, no one district electing more than one representative. The law also contains provisions to cover the cases of States whose legislatures should neglect to rearrange the apportionment before the election of representatives to the Forty-eighth Congress.

It is impossible to give here even a summary of the contents of the several large volumes which include the returns of the census of 1880 thus far published. From the industrial statistics, however, a few important figures may be selected. In 1850, the number of manufacturing establishments in the United States was alleged to be 123,029; in 1860, there were 140,433; in 1870, the number had advanced to 252,148; and in 1880, they were alleged to be no more than 253,840. The trifling apparent increase during the decade after 1870, is probably not in accordance with fact. The census authorities explain the difficulty by asserting that in the census of 1870 the facts were exaggerated. Complaints have been made also of the manner in which the industrial census of 1880 was taken in some places, notably in Philadelphia. In 1850, the capital invested in manufactures was returned as $533,245,351; in 1860, as $1,009,855,715; in 1870, as $2,118,208,769; and in 1880, as $2,790,223,506. The hands employed in manufacturing establishments were returned for the respective years as follows: for 1850, 958,079; for 1860, 1,311,246; for 1870, 2,053,996; for 1880, 2,738,750. In 1880, the total population so employed was composed of the following persons: 181,918 children; 531,753 females over 15 years; and 2,025,279 males over 16 years. In 1850, the wages paid in such establishments were $236,755,464; in 1860, $378,878,966; in 1870, $755,584,343; and in 1880, $947,919,674. That is, in 1880, the weekly wages paid for each working man, woman, and child was about $6.50. The materials consumed were valued in 1850 at $555,174,320; in 1860, at $1,031,605,092; in 1870, at $2,488,427,242; in 1880, at $3,394,340,029. The products, in 1850, were valued at $1,019,109,616; in 1860, at $1,885,861,676; in 1870, at $4,232,325,442; and in 1880, at $5,369,667,706.

Other American Censuses.—The only census on the Western continent which can be compared with the American is that of the Dominion of Canada. The first volume of the report of the census of 1880–1 appeared in 1882. The enumeration was made by a special staff organized for the purpose. It consisted of fourteen officers, in charge of as many provinces or large areas, with Mr. J. G. G. Layton, the Director of the Census of 1871, at their head. Under these were placed a corps of 205 district commissioners and 3,183 enumerators, and each rank received full oral instruction from that above it. Included in the enumeration were (1) statistics of living persons—residences, names, sex, age, nativity, religion, profession, education, infirmities, and condition as married or single; (2) returns of deaths and causes of death for the twelve months preceding; (3) public institutions, real estate, and industrial establishments; (4) cultivated lands, field products, etc.; (5) live stock, animal products, and furs; (6) forest industries and their products; (7) shipping and fisheries; (8) mineral products. The enumeration of the Indian population scattered over the northern parts of the Dominion was found to be impossible, and the estimates of 1871 were taken instead. This census does not include Newfoundland or its dependency, Labrador. For the former we have the census of 1874, with estimates for 1881; for the latter, estimates only.

Mexico makes no general enumeration of her people, but furnishes estimates for her provinces of various degrees of accuracy. In Central America Guatemala, in 1880, took a census by enumeration, which included nineteen of the twenty-two departments. Salvador took an official census in 1878, but apparently by estimate rather than enumeration. No census of Honduras, or Nicaragua, or Costa Rica has ever been taken, as the Indian population, which is much in the majority, will not agree to be counted. For the West Indies generally (as also for Iceland, Greenland, and the Bermudas) we have accurate returns, secured through the European governments, who own all these islands but one. For the Dominican Republic and the Empire of Hayti we have nothing but vague governmental estimates.

In South America Venezuela made an exact census of its people in 1881, making no distinction between the different stocks of the population. Colombia has taken no census since that of 1870, from which the uncivilized Indians were excluded. From Ecuador we have official estimates of 1878, with a rough guess at the number of uncivilized Indians. Peru made an official census in 1876, excluding the Indian savages. For Bolivia there are merely estimates made in 1878. Chili made an enumeration in 1875, which is supplemented by official estimates for 1880. The Argentine Confederation supplements in the same way the census taken in 1869. Uruguay completed a partial enumeration in 1880, which is supplemented by estimates. Brazil has made a nearly complete enumeration, which was begun in 1872 and ended by 1876. It distinguishes free persons from slaves, and excludes uncivilized Indians.

For the general results see the article AMERICA.

The English Census of 1881.—The last census in England was taken at midnight of the 3d of April, 1881. It was taken under three acts; one for England, one for Scotland, and one for Ireland. The Local Government Board, the Secretary of State, and the Lord Lieutenant were respectively charged with the execution of these acts. These acts provided for an enumeration of the people on the 3d of April, 1881; and they contained penalties for a refusal to give information or for giving false information.

In Ireland alone were particulars gathered as to the religious beliefs of the persons enumerated, but no penalty was incurred by a refusal to answer this question. The schedule for householders contained columns for information as to the name and surname; relation to head of family; condition as to marriage; sex; age last birthday; rank, profession, or occupation; place of birth, and if deaf or dumb, blind, imbecile, or lunatic. Minute directions were given as to the order in which "rank, profession, or occupation" should be stated, with special reference to ministers of religion. These schedules were distributed a week in advance by the enumerator. In 1871 England and Wales were divided into 626 superintendent registrars' districts, which were again divided into 2195 sub-districts, each having a local registrar of births and deaths. The local registrars laid out their sub-districts into 31,916 enumeration districts, following parish and township lines where it was possible to do so, and aiming to give each enumerator about two hundred houses in the towns, and in sparsely populated parts a district involving not more than fifteen miles' travel. There were also 627 special districts, prisons, workhouses, hospitals, etc., with over 200 inmates, for which the chief officials were made enumerators. The customs officers were intrusted with the duty of enumerating persons on board merchant vessels, fishing-boats, and other craft in various ports and rivers. The schedules in these cases were filled up by the masters of the vessels on the census day; and on the arrival of every home trade and coasting vessel within the month next following the masters of such vessels were required to fill up a schedule, if they had not previously done so in any port in the United Kingdom. In the army and navy the enumeration was conducted by the authorities at the Horse Guards and Admiralty. Care was taken to include those sleeping on the night of April 3d in barns, tents, or in the open air; the case of the few people travelling on that night was provided for, and the schedule was not to take any notice of those who died at 11.59 P.M. or were born at 12.01 A.M.

The English enumerators had a fixed fee of a guinea, with 2s. 6d. for every hundred names above 400. Thus, if a man had a district of 200 houses and 1200 inhabitants, about as many as he could attend to, he earned £2 1s.—say, $10. To get this he must have left the schedule with every occupier of a house or tenement during the preceding week, and on the 3d of April he must have collected the schedules, seeing that they were filled up correctly, and filling them in himself in cases of neglect or incapacity. Then it was his duty to copy their contents into enumeration books, to summarize them, describe accurately the boundaries of the district, and hand over books and schedules to the registrar. In Wales some 20,000 of the 60,000 schedules issued in Welsh were returned filled up in that language, and had to be translated. The registrar revised carefully the entries in the enumeration books, collated them and prepared a summary for his sub-district, which was forwarded with all the documents to the superintendent registrar. Upon the superintendent registrar was imposed the duty of making a general revision of the returns and of testing their accuracy with a view of seeing that the registrars and enumerators had properly performed their duties. By the end of May all the returns and books were in London, and a month later the preliminary statement of the result of the census was published. The returns showed the population of the United Kingdom to be 35,246,562.

Populations According to Recent Censuses.

COUNTRY.	Date of Census.	Population.
France	1881	37,321,186
Prussia	1880	27,279,111
Saxony	1880	2,972,805
Bavaria	1880	5,284,778
Wurtemberg	1880	1,971,118
Baden.	1880	1,570,254
Austria	1880	22,144,244
Hungary	1880	15,725,710
Belgium	1879	5,536,654
Holland	1879	4,012,693
Switzerland	1880	2,846,102
Sweden	1880	4,565,668
Norway	1878	1,878,100
Spain	1877	16,625,860
Italy	1879	28,437,091
Russia (in Europe)	1879	83,626,590
England and Wales	1881	25,968,286
Scotland	1881	3,734,370
Ireland	1881	5,159,839
United States	1880	50,155,783
Denmark	1880	1,969,039
Finland	1879	2,028,021
Portugal	1878	4,160,315
Turkey (in Europe)	1878	8,630,950
Greece	1879	1,979,423
Dominion of Canada	1881	4,324,810
Newfoundland and Labrador	1874	173,916
Bermudas	1879	13,956
Mexico	1874	9,577,279
Central America	1878	2,893,000
West Indies (estimated)	....	4,617,450
Brazil	1872	11,108,291
S. America (except Brazil) estimated	....	28,380,250
Asia (estimated)	....	795,591,000
Africa (estimated)	....	205,823,260
Australia	....	4,232,000
Polar Regions (estimated)	....	82,500

In relation to the general subject, the following works may be consulted:—A. Quetelot, *Sur l'Homme et le Développement de ses Facultés; ou Essai de Physique sociale;* David Hume "On the Populousness of Ancient Nations," *Philosophical Works,* vol. iii.; Quetelet et Heuschling, *Statistique Internationale;* Lord Macaulay, *History of England,* vol. i.; Babbage, *Ninth Bridgewater Treatise; Reports and Proceedings of the International Statistical Congress, Fourth Session* (London, 1861); Boeckh, *Political Economy of the Athenians,* Book IV, chap. 5; Sir John Sinclair, *History of the Statistical Account of Scotland;* John Graunt, *Natural and Political Observations on the Bills of Mortality;* Moreau de Jonnes, *État économique et sociale de la France depuis Henri IV jusqu' à Louis XIV.* The *London Statistical Society's Journal* contains numerous articles on the census, and is of the greatest value to those investigating the subject. (S. S. C.)

POPULATION BY STATES AND TERRITORIES, 1790-1880.

Aggregate Population at each Census as Constituted at the Date of that Census.

(NOTE.—The narrow column under each census year shows the order of the States and Territories when arranged according to magnitude of population.)

STATES AND TERRITORIES.	1880.		1870.		1860.		1850.		1840.		1830.		1820.		1810.		1800.		1790.	
Total........		50,155,783		38,558,371		31,443,321		23,191,876		*17,069,453		†12,866,020		9,633,822		7,239,881		5,308,483		3,929,214
Alabama........	17	1,262,505	16	996,992	13	964,201	12	771,623	12	590,756	15	309,527	19	127,901	...	...	...	...	...	...
Arizona........	44	40,440	46	9,658	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Arkansas........	25	802,525	26	484,471	25	435,450	26	209,897	25	97,574	28	30,388	26	14,255	...	...	...	...	...	...
California	24	864,694	24	560,247	26	379,994	29	92,597	...	...	...	...	...	...	...	...	...	...	...	...
Colorado........	35	194,327	41	39,864	38	34,277	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Connecticut...	28	622,700	25	537,454	24	460,147	21	370,792	20	309,978	16	297,675	14	275,148	9	261,942	8	251,002	8	237,946
Dakota	40	135,177	45	14,181	42	4,837	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Delaware........	38	146,608	35	125,015	32	112,216	30	91,532	26	78,085	24	76,748	22	72,749	19	72,674	17	64,273	16	59,096
D.ofColumbia	36	177,624	34	131,700	35	75,080	33	51,687	28	43,712	25	39,834	23	33,039	22	24,023	19	14,093	...	...
Florida........	34	269,493	33	187,748	31	140,424	31	87,445	27	54,477	26	34,730	...	...	...	...	...	...	...	...
Georgia	13	1,542,180	12	1,184,109	11	1,057,286	9	906,185	9	691,392	10	516,823	11	340,985	11	252,433	12	162,686	13	82,548
Idaho........	46	32,610	44	14,999	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Illinois........	4	3,077,871	4	2,539,891	4	1,711,951	11	851,470	14	476,183	20	157,445	24	55,162	24	12,282	...	...	...	...
Indiana	6	1,978,301	6	1,680,637	6	1,350,428	7	988,416	10	685,866	13	343,031	18	147,178	21	24,520	21	5,641	...	...
Iowa	10	1,624,615	11	1,194,020	20	674,913	27	192,214	29	43,112	...	...	...	...	...	...	...	...	...	...
Kansas........	20	996,096	29	364,399	33	107,206	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kentucky	8	1,648,690	8	1,321,011	9	1,155,684	8	982,405	6	779,828	6	687,917	6	564,135	7	406,511	9	220,955	14	73,677
Louisiana	22	939,946	21	726,915	17	708,002	18	517,762	19	352,411	19	215,739	17	152,923	18	76,556	...	...	...	...
Maine	27	648,936	23	626,915	22	628,279	16	583,169	13	501,793	12	399,455	12	298,269	14	228,705	14	151,719	11	96,540
Maryland......	23	934,943	20	780,894	19	687,049	17	583,034	15	470,019	11	447,040	10	407,350	8	380,546	7	341,548	6	319,728
Massachusetts	7	1,783,085	7	1,457,351	7	1,231,066	6	994,514	8	737,699	8	610,408	7	523,159	5	472,040	5	422,845	4	378,787
Michigan......	9	1,636,937	13	1,184,059	16	749,113	20	397,654	23	212,267	27	31,639	27	8,765	25	4,762	...	...	...	...
Minnesota	26	780,773	28	439,706	30	172,023	36	6,077	...	...	...	...	...	...	...	...	...	...	...	...
Mississippi......	18	1,131,597	18	827,922	14	791,305	15	606,526	17	375,651	22	136,621	21	75,448	20	40,352	20	8,850	...	...
Missouri........	5	2,168,380	5	1,721,295	8	1,182,012	13	682,044	16	383,702	21	140,455	23	66,557	21	20,845	...	...	...	...
Montana........	45	39,159	43	20,595	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nebraska........	30	452,402	36	122,993	39	28,841	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nevada........	43	62,266	40	42,491	41	6,857	...	...	...	...	...	...	...	...	...	...	...	...	...	...
N.Hampshire.	31	346,991	31	318,300	27	326,073	22	317,976	22	284,574	18	269,328	15	244,022	16	214,460	11	183,858	10	141,885
New Jersey....	19	1,131,116	17	906,096	21	672,035	19	489,555	18	373,306	14	320,823	13	277,426	12	245,562	10	211,149	9	184,139
New Mexico..	41	119,565	37	91,874	34	93,516	32	61,547	...	...	...	...	...	...	...	...	...	...	...	...
New York	1	5,082,871	1	4,382,759	1	3,880,735	1	3,097,394	1	2,428,921	1	1,918,608	1	1,372,111	2	959,049	3	589,051	5	340,120
N. Carolina...	15	1,399,750	14	1,071,361	12	992,622	10	869,039	7	753,419	5	737,987	4	638,829	4	555,500	4	478,103	3	393,751
Ohio	3	3,198,062	3	2,665,260	3	2,339,511	3	1,980,329	3	1,519,467	4	937,903	5	581,295	13	230,760	18	45,365	...	...
Oregon	37	174,768	38	90,923	36	52,465	34	13,294	...	...	...	...	...	...	...	...	...	...	...	...
Pennsylvania	2	4,282,891	2	3,521,951	2	2,906,215	2	2,311,786	2	1,724,033	2	1,348,233	3	1,047,507	3	810,091	2	602,365	2	434,373
Rhode Island.	33	276,531	32	217,353	29	174,620	28	147,545	24	108,830	21	97,199	20	83,015	17	76,931	16	69,122	15	68,825
S.Carolina......	21	995,577	22	705,606	18	703,708	14	668,507	11	594,398	9	581,185	8	502,741	6	415,115	6	345,591	7	249,073
Tennessee......	12	1,542,359	9	1,258,520	10	1,109,801	5	1,002,717	5	829,210	7	681,904	9	422,771	10	261,727	15	105,602	17	35,691
Texas........	11	1,591,749	19	818,579	23	604,215	25	212,592	...	...	...	...	...	...	...	...	...	...	...	...
Utah........	39	143,963	39	86,786	37	40,273	35	11,380	...	...	...	...	...	...	...	...	...	...	...	...
Vermont........	32	332,286	30	330,551	28	315,098	23	314,120	21	291,948	17	280,652	16	235,966	15	217,895	13	154,465	12	85,425
Virginia........	14	1,512,565	10	1,225,163	5	1,596,318	4	1,421,661	4	1,239,797	3	1,211,405	2	1,065,116	1	974,600	1	880,200	1	747,610
Washington...	42	75,116	42	23,955	40	11,594	...	...	...	...	...	...	...	...	...	...	...	...	...	...
West Virginia	29	618,457	27	442,014	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wisconsin......	16	1,315,497	15	1,054,670	15	775,881	24	305,391	30	30,945	...	...	...	...	...	...	...	...	...	...
Wyoming	47	20,789	47	9,118	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Including 6,100 persons on public ships in the service of the United States.

† Including 5,318 persons on public ships in the service of the United States.

CENTERVILLE, a city of Appanoose co., Iowa, is 8 miles N. of the Missouri State line and 75 miles S. E. of Des Moines. It is on the Chicago, Rock Island, and Pacific Railroad, and is connected by branches with the Wabash, St. Louis, and Pacific and the Chicago, Burlington, and Quincy Railroads. It has a court-house, four hotels, three banks (one national), two weekly newspapers, six churches, and five schools. Its industries comprise a brass-foundry, machine-shops, saw-, planing-, carding-, and flour-mills, manufactories of barbed wire and guns, and several creameries. It was settled in 1852, incorporated as a town in 1859, and as a city in 1874. Population, 2475.

CENTOFANTI, SILVESTRO (1794–1880), an Italian philosopher and literary historian, was born at Calci, near Pisa, Dec. 8, 1794. He studied law, but soon devoted himself especially to literature and philosophy. In 1829 he published *Edipo Re*, a tragedy, and afterward some essays on Dante and Alfieri. In 1841 he was made professor of philosophy at Pisa. On account of his active participation in the revolutionary movements of 1848 he was removed from his professorship, but in 1849 he was appointed inspector-general of the libraries of Tuscany. In 1859 he was restored to his professorship and made a member of the council of state. He afterward became rector of the University of Pisa and senator of the kingdom of Italy. He died at Pisa, Jan. 6, 1880. His most important work is *La Letteratura greca dalla sua origine sino alla Caduta di Costantinopoli* (Florence, 1870). He left several works in manuscript, and since his death one has been published, *Vita poetica* (Florence, 1881).

CENTRAL CITY, the county-seat of Gilpin co., Col., is on a branch of North Clear Creek, and is the terminus of a branch of the Colorado Central Railroad, 38 miles W. of Denver. Its only industry is gold- and silver-mining. It has three banks and a daily and two weekly newspapers. Population, 2626.

CENTRAL FALLS, a village of Providence co., R. I., is on the Blackstone River, 5 miles N. of Providence, with which it is connected by the Providence and Worcester Railroad and the Boston and Providence Railroad. It is largely engaged in manufacturing, having brass- and iron-foundries, machine-shops, grain-mills, curled-hair works, cotton- and woollen-mills. It has five churches, sixteen schools, a weekly newspaper, several halls, and a taxable property of $4,500,000. Population, about 8000.

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